II. *On the Hymenopterous Parasites of Coleoptera.*[1] By Ernest A. Elliott, F.Z.S., and Claude Morley, F.E.S.

[Read February 6th, 1907.]

The subject of parasitism on Coleoptera does not appear to have been especially taken up by any Entomologist. Prof. Ratzeburg and a few of his contemporaries collected a large amount of information on the parasites of Forest insects in general, and the former studied a few Coleoptera —*Cureulio notatus* and some of the bark borers—more particularly. The results are found in the "Ichneumonen der Forstinsekten," to which work (so little known in England) we are indebted for a great number of the records in the following paper. Marshall's records are all taken from other authors, but are useful in so far as they refer to the original records. Another valuable work is Giraud's posthumous "Liste des éclosions d'Insectes," in which, however, there occur manuscript names. Otherwise the records are mostly scattered through numerous British and Continental magazines, and are only to be discovered by laborious research. While not claiming to include every published record on the subject, or any great amount of original work, we trust that the following list will be found of sufficient interest to encourage others to carry on the work, both by means of personal observation and by bringing to our notice records we may have overlooked.

1. *Calosoma sycophanta*, Linn.

"Once I caught a large, fat larva of *Calosoma*, and put it in spirits of wine. Soon afterwards it burst, and little larvæ of *Microgaster* thronged out; over a hundred lay closely piled up together, with the anal extremity turned towards the abdominal end of the larva." (Ratz., Ichn. d. Forst. i, 23, footnote; host specified at *lib. cit.* ii, 212.)

[1] The Coleoptera bearing an asterisk are extra-British. The numbers in small type after the parasites' names refer to those *prefixed* to the "Classified List of Parasites," *post.*

2. *Carabus violaceus*, Linn.

Dr. Ratzeburg says of his *Phygadeuon campoplegoides*[9] (*l. c.* ii, 124): This remarkable little pair came from Herr Drewsen, who writes as follows: "Out of *Tachina pacta*, which, as is well known, lives in *Carabus violaceus*." The synonymy of this Cryptid is still doubtful (cf. Morley, Ichn. Brit. ii, 88).

3. *Nebria brevicollis*, Fab.

Van Vollenhoven (Pinac. fol. xxxi) says: "Curtis bred *Proctotrypes* (?) *viator* from the larves of *Nebria brevicollis*." This refers to the latter's statement (Farm Insects, 198) "that on opening the cells of the specimens of this beetle sent to me by Mr. Graham, I found one partly consumed, and the other had produced six specimens of *Proctotrupes viator* (?): thus showing that this parasite keeps in check . . . the larvæ of ground beetles."

4. *Nebria gyllenhali*, Sch.

5. *Patrobus assimilis*, Chaud.

In describing *Oresbius castaneus* from the top of Garbhavel, near Loch Rannoch, the Rev. T. A. Marshall (E. M. M. iii. [1867], p. 194) writes: "This species may be suspected of being a parasite of *Nebria*, *Patrobus*," etc. *N. gyllenhali* would be the only British species of the genus at that altitude—3,500 feet.

6. *Pterostichus vulgaris*, Linn.

Curtis says the larvæ of *Omaseus melanarius*, Ill., are "frequently infested by a parasite called *Proctotrupes viator*" (Farm Insects, 131).

7. *Gyrinus natator*, Scop.

Mr. F. Bouskell tells us that, in 1894, he bred two or three different sorts of parasites from pupæ of this beetle found by him on reeds at the Cropstone reservoir in Leicestershire. "Mr. Parfitt first bred ♂♂ of his *Hemiteles gyrini*,"[16] says Morley (Ichn. Brit. ii, 163), "from spring pupa-cases, and Bignell also raised it, from pupæ of *Gyrinus natator* found by the Rev. J. Hellins upon rushes on the banks of the Exeter Canal, of which the latter has allowed me to examine both sexes; it is later recorded as bred

from the same host, together with *Pezomachus* (?) *viduus*,[24] Först. One is led to wonder whether the latter could have been a dimorphic ♀ of the same species." Of *H. persector*, he says (*lib. cit.* 160), "bred from some pupæ of *Gyrinus natator*, collected by the Rev. J. Hellins, from rushes on the banks of the Exeter canal. It did not, however, emerge till later than *H. gyrini* (*argentatus*, Grav.), with which it appears to be associated."

8. *Phlœopora reptans*, Grav.

Morley (Ichn. Brit. ii, 134) took *Hemiteles areator* in February 1899, associating, though perhaps accidentally, with this beetle beneath pine bark, near Ipswich.

9. *Myrmedonia collaris*, Payk.

A ♀ of *Microcryptus nigrocinctus* was taken in Wicken Fen in Cambs., by Donisthorpe, associating with this beetle, which it much resembles, in a nest of *Myrmica lævinodis* (*cf.* Morley, Ichn. Brit. ii, 42).

10. *Creophilus maxillosus*, Linn.

Marshall writing of the common Braconid, *Alysia manducator* (Bracon. d'Europ. ii, 377) says: "On a vérifié leur parasitisme dans les larves de *Lucilia* . . . et ce, qui semble plus remarquable, dans les larves formidables du coléoptère *Creophilus maxillosus*, L., qui habitent constamment les cadavres." We have repeatedly captured this parasite on carrion.

11. *Ocypus olens*, Müll.

A beetle-larva, twenty-two millimetres in length, was dug up from beneath the surface of the ground in Mr. Morley's garden (Monks Soham House, Suffolk) on 9th Sept. 1905. This, there can be no doubt, is that of *Ocypus olens*—as figured by Westwood (Mod. Class. i, 166, fig. xvi, 1), since *Creophilus* feeds in carrion, etc. This larva was placed in a chip box and, the following day, had become moribund with seventeen hymenopterous larvæ protruding from its ventral surface. The latter lived till October and all assumed the pupal state, the first three on 28th Sept., of which two (in the fifth segment) alone assumed the blackness of maturity. Unfortunately they

all died—probably through lack of moisture—in the position and situation indicated below.[1]

Third segment (between the intermediate and hind-legs) three protruded ; two from the centre and one a little to the right side ; two with head and half thorax discovered, and one—the hinder central—with only half its head showing.

Fourth segment (well behind the hind-legs) three ; two from the centre and one a little to the left side ; all with head and thorax, and the hindmost slightly more, protruded.

Fifth segment, four ; two from the centre, a third slightly before and to the right of the first central one, and the fourth level with and to the left of the second central ; the foremost central is the furthest protruded and most fully developed of all, being held *in situ* only by its fifth abdominal segment and anus, the right-hand one is next fully developed with its fourth segment and anus still encased, the hinder central has little more than its basal segment protruded and the left-hand one has exserted only its head and fore part of thorax.

Six to tenth segments all bear one equally developed parasite, exposed to about the base of the mesothorax.

Eleventh segment, two ; the basal considerably to the right and the apical exactly in the centre and so close to the anus as to have nearly severed the host's conical anal proleg, which is thrust obliquely aside.

Even the most advanced specimen is much too immature to guess specifically. The only reliable feature discernible is a distinct central longitudinal carina throughout the metathorax; this at once precludes the parasites from the Ichneumonidæ and, combined with their general facies, lends strong probability to their appertaining to the Braconid genus *Apanteles*, many of whose species (*A. salebrosus*, Marsh., etc.) possess such a central carina. But they did not evacuate their host, nor spin the least trace of cocoons—simply protruded in their larval, subsequently pupal, skins.[2]

[1] The body of the host from the fifth segment to the anus is so distorted by the parasites that it is only the manner in which they themselves are grouped which enables the distinction of the segments to be surmised.

[2] "Many years ago, I found under a stone a shrunken beetle larva, which undoubtedly belonged to the *Staphylinæ*, dead. In it were several parasites in naked pupal state : these proved to be *Codrus pallipes*,[428A] Jur." (Kawall, Stett. Ent. Zeit. 1855, p. 260).

12. *Cafius xantholoma*, Grav.

12*a*. *Micralymma brevipenne*, Gyll.

Mr. E. A. Newbery has found *Platymischus dilatatus*, Westw., to be parasitic upon this *Cafius* at Plymouth, in May 1895. And at Berl. Ent. Zeit. 1859, p. 98, we find that "Mr. George Wailer undoubtedly observed, at Newcastle, that *Platymischus* was parasitic on *Micralymma brevipenne*, Gyll."; attention is also there drawn to the occurrence of such a parasite on an at times submarine host.

13. *Teretrius picipes*, Fab.

Westwood (Mod. Class. i, 182) writes: "*Paromalus picipes*, according to Dalman, is parasitically attacked by *Pteromalus micans*"[288] and refers to the Swed. Trans. 1822. At *lib. cit.* ii, 159, he adds: "*Perilampus micans* was always observed upon posts perforated by . . . *Hister picipes* by Dalman."

14. *Anatis ocellata*, Linn.

On 10th August, Ratzeburg (Ichn. d. Forst. i, 211) boxed a larva of *Coccinella ocellata*, which he thought unusually large and sluggish, and probably parasited. It devoured a larva of *Lophyrus*, but would subsequently eat nothing. Soon it affixed its anus to a leaf and became motionless, but without pupating. In the following spring he found his *Eupelmus Eytelweinii*[283] dead in the box and a small hole in the side of the larva's back; it may have emerged the preceding autumn. The larva had retained its natural form, and had only lost its red and white spots. Five years later (*lib. cit.* ii, 145) he discovered two more specimens of the same parasite in the box, in which the larva had been left; a second hole was then found in the larva's skin. He thought these later specimens could have but recently emerged, since he had often examined the box in which they had been kept.

15. *Coccinella quinquepunctata*, Linn.

Marshall (Bracon. d'Europ. ii, 45), writing of *Perilitus terminatus*, says: "Audouin, dans son mémoire 'Sur le Parasitisme des Insectes,' nous a laissé une indication des habitudes de cette espèce. Il s'est assuré qu'un individu

était sorti d'un coléoptère du genre *Coccinella*, soit *septempunctata* soit *quinquepunctata*, L. Des expériences ultérieures faites par Ratzeburg ont démonstré l'exactitude de l'observation d'Audouin." Bignell (Trans. Devon. Assoc. 1901, p. 662) adds that when full-fed the larva of the *Perilitus* issues from the sutures of the perfect ladybird's ventral segments and that the latter afterwards coalesce, leaving no visible aperture. On emerging the parasitic larva spins a pyriform cocoon, interlacing the dead beetle's legs and so holding its body as an additional rampart against possible enemies.

16. *Coccinella septempunctata*, Linn.

"M. V. Audouin . . . has informed me that he had observed that *C. 7-punctata* is subject to the parasitic attacks of *Microctonus terminalis*,[213] Wesm., and *Encyrtus flaminius*, Dalm." (Westw. i, 397 et ii, 159). "Audouin has obtained *M. terminalis* from the perfect *Coccinella 7-punctata*, the larva of the former bursting forth and spinning its cocoon beneath the body of the latter" (*lib. cit.* ii, 142). Also referred to by Kirby and Spence [misprinted *C. 17-punctata* in 7th Ed. 1859, p. 155]; Marshall (Bracon. d'Europ. ii, 45) and Ratzeburg (Ichn. d. Forst. iii, 61), who tells us that Bouché (*lib. cit.* i, 122) several times bred *Bassus exultans*,[94] Grav., from this host. Morley (Ichn. Brit. ii. 235) also bred a couple of ♀♀ *Pezomachus fasciatus* from a single pupa of this beetle at Ipswich in 1894.

17. *Megilla maculata*, DeG.*

"Il est maintenant bien constaté que la *M. maculata* des Etats-Unis . . . est infesté par des parasites du genre *Perilitus*" (Marsh., Bracon. d'Europ. ii, 45). Cf. also *Centistes americana*, Riley, Insect Life, 1888, p. 101.

18. *Endomychus coccineus*, Linn.

Referring to Curtis' discovery of this species' larvæ, Westwood (Mod. Class. i, 394) says, "some were attacked by a Chalcidideous parasite." Cf. also *lib. cit.* ii, 159, *et* Ratz., Ichn. d. Forst. ii, 187. Of these larvæ, Curtis (B. E pl. 570) simply says, "some of the largest seemed as if they were either dead or in a torpid state, but these proved to have been punctured by a little parasite allied to *Gnatho dispar* (*Colax*, pl. 166), a great number of which afterwards

hatched." From Curtis' MS., Walker described this parasite (Ent. Mag. 1836, p. 496) as *Pteromalus Endomychi*, "reared by Mr. Curtis, from the larva of *Endomychus coccineus*."

19. *Triplax russica*, Linn.

Under *Meteorus obfuscatus*, Marshall (Bracon. d'Europ, ii, 92) tells us, on the authority of Dr. Reinhard, that in the Sichel collection, in Paris, ten of these parasites are preserved, which were bred by Lespès from this beetle ; he expressly says that they emerged from the larvæ and not from the imago, "An den Nadeln sind noch die Käferlarven mit dem Cocon der Parasiten befestigt."

20. *Meligethes æneus*, Fab.

C. G. A. Brischke gives (Schr. Nat. Ges. Danz. 1880, p. 193) *Thersilochus morionellus*, Holmgr., a small Ophionid, as parasitic upon *Meligethes æneus*.

21. *Meligethes viridescens*, Fab.

Dr. Alexandre Laboulbène, in his "Liste des éclosions d'Insectes," observed by Giraud (Ann. Soc. France, 1877, p. 424), instances the emergence of *Callimome difficilis*,[289] Nees, which is usually parasitic upon the Bedeguar gall-flies, from this beetle.

22. *Synchita juglandis*, Fab.

A single ♂ of *Brachistes destitutus* [237] was bred by Herr Nördlinger from *S. Juglandis* in hornbeam in Germany (Ichn. d. Forst. ii. 28).

23. *Læmophlæus ferrugineus*, Steph.

24. *Typhæa fumata*, Linn.

Morley (Ichn. Brit. ii, 141) says he has found *Hemiteles subzonatus*, Grav., beneath the bark of a felled log full of these two species of beetles in May, at Wherstead, in Suffolk.

25. *Dermestes.*

26. *Anthrenus.*

Westwood (Mod. Class. ii, 143) writes, "other species" of Ichneumonidæ and Braconidæ "(*Hemiteles areator*, etc.) also

frequent our dwellings, to deposit their eggs in the larvæ of *Dermestidæ*, *Anthreni*, *Tineæ*, and other domestic insects." These vague and general statements are dangerous, since the above is undoubtedly the foundation of Taschenberg's apparently established fact (Zeits. Ges. Nat. 1865, p. 130) under *H. arcator*, Panz.: "Wurde erzogen . . . aus *Dermestes—Anthrenus*—und *Tineen*—Larven"; and Ratzeburg (Ichn. d. Forst. i, 151) takes the same view. Cf., however, Morley, Ichn. Brit. ii, 133.

27. *Sinodendron cylindricum*, Linn.

Keys first took localised British specimens of *Hister-omerus mystacinus*, Wesm., on 14th August, 1901, from the burrows of this beetle; and ten days later Bignell and he discovered three of these coleopterous larvæ each surrounded by about a dozen apparently full-fed larvæ of this parasite, which had evidently just emerged from the bodies of the former (cf. Trans. Devon. Assoc. 1901, p. 666). Nördlinger bred *Eupelmus incrmis*[280] from an ailing beech in the Swabian Alps, in Würtemburg, in which this beetle, among others, was boring (Ichn. d. Forst. ii, 152).

28. *Oryctes nasicornis*, Linn.*

In his Wirths-system, Ratzeburg simply gives (Ichn. d. Forst. ii, 215) *Pimpla instigator*, Fab., as parasitic upon *Scarabæus nasicornis*; no mention of it seems to appear in the text.[1]

29. *Buprestidæ*.

Most of the unspecified *Buprestes* given by Ratzeburg (*lib. cit.* i, 23; ii, 212; iii, 249) are either subsequently

[1] This record must, I think, be based upon Passerini's "Osservazioni sulle Larve, Ninfe, etc." (Pise, 1840; cf. also Guérin-Méneville in Revue Zoolog. 1841, p 240). He found that *Scolia flavifrons* places its eggs on the larva of *Oryctes nasicornis*, and the larvæ when hatched feed by introducing the three capital segments into the belly of the beetle-caterpillar, always between the sixth and seventh segments (*cf.* Kirby and Spence, Introd. 7th Ed. 1859, p. 195). This parasitic Fosser is not British; "the genus *Tiphia* is the only representative of the family *Scoliadæ*, being closely allied to the genus *Scolia*. . . . . *Tiphia femorata*, I have every reason to believe, to be the parasite of a species of *Aphodius;* I have several times found it beneath the droppings of cows and horses" (Smith, Ent. Ann. 1862, p. 77). Gravenhorst, of course, mentions no Aculeata, but gives *Ichneumon flavifrons*, Schr., with a note that Schäffer's figure of it resembles *Pimpla instigator*, Fab. Ratzeburg, it is highly probable, draws his erroneous inference from this association.—C. M.

named or their parasites again bred from recognised hosts of the same genus (*sensu lato*). *Lissonota catenator*,[73] however, one ♀ of which was bred by Bachmann, "from an unknown beetle larva, in rotten lime wood" (iii. 107); *Spathius curvicaudis*, of which Nördlinger bred a single ♀, from a beetle larva, boring in the manner of *Buprestis* (i. 50), and *Ptcromalus guttatus*, were not so assigned.

30. *Chalcophora mariana*, Linn.*

Dr. Leop. Kirchner, in his 1867 Cat. Hym. Europæ, p. 107, under *Ephialtes manifestator*, Linn., writes, "Schmarotzer von *Buprestis Mariana*," probably basing his statement upon Ratzeburg's record (Ichn. d. Forst. i. 119) that a fine and large pupa of this Pimplid cut its way out of an old fir stump, in which, judging solely by the borings, larvæ of *B. Mariana* had lived. This record must, however, be regarded with doubt since no one nowadays quite knows what the Linnean parasite was![1]

31. *Dicerca berolinensis*, Herbst.*

We are also indebted to Kirchner (Cat. 115) for the record of *Dorycles imperator* as parasitic upon this beetle; it is copied by Marshall (Brac. d'Europ. i. 229).

32. *Anthaxia quadripunctata*, Linn.

From fir wood, in which larvæ of *Buprestis 4-punctata* were living, Ratzeburg (Ichn. d. Forst. iii, 44) bred a single ♀ of his *Exotheeus lignarius*[183], which is extremely like *Spathius brevicaudis*, but with the petiole broader and parallel nervure different; the latter parasite was bred plentifully from the same beetle and locality. *Pimpla*

[1] That *Ephialtes rex*, Kriech., rather than *E. imperator*, Kriech. (as indicated by Schmiedeknecht, Opusc. Ichn. xiv, 1120), was described under the name *E. manifestator* by Gravenhorst (Ichn. Europ. iii, 232) was recognised by Marshall (Brit. Cat. 1872, p. 85), and I certainly think the description of the abdominal segments as bearing "tuberculo laterali obsoleto" is sufficient to establish the fact, especially if *excl. indiv. stigmate nigro* be added; cf. also Thoms. Opusc. Ent. xii, 1249. The *Ichneumon manifestator*, whose economy is so interestingly recounted by Thomas Marsham (Trans. Linn. Soc. iii [1794], pp. 23–29 et pl. iv.) must doubtless be referred to the common *Ephialtes carbonarius*, Christ.—the *Musca tripilis secunda* of old Mouffet, 1634, p. 64—on account of the lack of abdominal tubercles and its length not exceeding eight lines.—C. M.

linearis (iii, 99) and the rare *Eusandalum abbreviatum* (iii, 200) probably preyed upon the same host, emerging late in the season, the latter from fir billets. *E. lignarius*[183] is indicated as a parasite of this species, with no query, by Kirchner (Cat. 112); but Marshall (i, 265) simply gives *Clinocentrus lignarius* as a "parasite supposé" and insufficiently described.

33. *Agrilus biguttatus*, Fab.

Ratzeburg says that his *Exochus compressiventris* (Ichn. d. Forst. ii, 121, queried as a true parasite at ii, 212) was probably bred from *Buprestis biguttata*: "The present ♀ was in the thick bark of a strong oak, in which I was seeking for Buprestidæ." It is associated with no query by Kirchner (Cat. 82). *Spathius radzayanus* is another doubtful parasite upon this beetle: Herr Radzay (Ichn. d. Forst. ii, 43) bred it from an oak in which *Cureulio depressirostris*, *Buprestis biguttata* and several species of *Clytus* were all burrowing and to which they were doing considerable injury.

34. *Agrilus viridis*, Linn.

From this beetle, Kirchner (Cat. 114), says that *Corystes aciculatus*,[156] Reinh., has been bred. Ten ♀ ♀ and one ♂ of *Eulophus agrilorum*[396] were bred by Ratzeburg (Ichn. d. Forst. i, 169) in June from a beech knot, in which was *Agrilus nocivus*, Ratz.; and Reissig (*l. c.* iii, 242) also bred *Pteromalus æmulus* from the same variety of *A. viridis*.

35. *Throscus dermestoides*, Linn.

The anomalous *Pachylomma buccata* is given by Ratzeburg (*lib. cit.* ii, 53) as having been taken by Hartig flying round *Throscus adstrictor*, with the supposed intention of ovipositing therein. Marshall, however, who treats this parasite as an aberrant member of the Braconidæ, quotes (Bracon. d'Europ. ii, 625) his own and Giraud's observations upon the association of *Pachylomma* with ants; and adds: "après les observations faites sur *P. cremieri*, constatant les rapports qui existent entre les *Pachylomma* et les fourmis, on est autorisé à rejecter tout opinion contraire."

36. *Agriotes*.

There appears to have been no record of parasitism in the Elateridæ since Kirby said (Introd. Ent. 7th Ed. 1859,

p. 154): "Mr. Paul has shown me the destroyer of the wire-worm, which belongs to Latreille's genus *Proctotrupes*."

37. *Malachius æneus*, Linn.

We have a very uncertain record concerning this beetle: Herr Reissig (Ichn. d. Forst. iii, 109) bred *Ephialtes glabratus* from spruce cones, together with *Tortrix strobilana*, *Anobium* and *Malachius æneus*. Which it had preyed upon remained uncertain.

38. *Dasytes*.

Under *Mesostenus ater*, Kirchner writes (Cat. 57): "Nördlinger erzog ihn aus einem alten Buchenstocke, worin *Melandrya*, *Sphex* und *Dasytes* gehauset." A single ♂ of this parasite was bred by Nördlinger from an old beech stump, in which *Melandrya*, [? *Sphex* and *Dasytes*] were boring (Ichn. d. Forst. iii, 143). *Ephialtes gracilis* [40] has also been several times bred from oak (*l. c.* iii, 109); sometimes a *Dasytes* appeared with it, at others a *Raphidia* or *Crabro*.

39. *Dasytes niger*, Linn.

Campoplex pusillus [104] and *Ephialtes gracilis* [40] are indicated by Ratzeburg (*lib. cit.* iii, 249) as preying upon this species.

40. *Dasytes cæruleus*, Fab.

At Schr. Nat. Ges. Danz. 1880, p. 110, Brischke describes his *Ephialtes discolor*, and adds: "Aus Lindenstöcken mit *Dasytes cærulea* und *Exenterus balteatus* erzogen." This may be Ratzeburg's *Pimpla lignicola* [67] (Ichn. d. Forst. iii, 98), which he found in worm-eaten oaks tenanted by *Dasytes cærulæus*.

41. *Thanasimus formicarius*, Linn.[1]

Ratzeburg (*lib. cit.* iii, 249) records *Hemiteles melanarius* and, with doubt, *H. modestus* [18] and *Bracon palpebrator* as parasitic upon *Clerus formicarius*. [Cf. also *Mesostenus brachycentrus*, under *Hylesinus crenatus*, *post.*] Marshall (Bracon. d'Europ. i, 167) does not note this doubtful

[1] Stephens (Illust. Suppl. 8) says of *Perilampus micans*, Dalm., "found in company with *Lyctus oblongus* and *Tillus unifasciatus*," on new oak palings at Camberwell.

association of the Braconid, but expresses his opinion that it is closely allied to, if not actually identical with, *Clinocentrus exsertor*, Nees.

42. *Hylecœtus dermestoides*, Linn.

From this species, Wissmann bred in Germany (Ichn. d. Forst. ii, 69) several specimens of *Aspigonus diversicornis* [255] and perhaps also a species of *Helcon*.

43. *Ptinidæ*.

Another of Westwood's general statements (Mod. Class. ii, 143) is: "A small, pretty, spotted-winged *Cryptus* enters our houses to prey upon the larvæ of the *Ptinidæ*; as do also *Spathius clavatus* [147] and *Hecabolus sulcatus*"; the first-named is certainly *Hemiteles areator*, Panz. (cf. Morley, Ichn. Brit. ii, 133). *Ptinus fur* and *Niptus hololeucus* are, however, the only common domestic *Ptinidæ*, and there is no record of hymenopterous attacks upon these species.

44. *Hedobia imperialis*, Linn.

Westwood may, however, be correct in the above statement, since the parasitism of *Hemiteles areator* upon *Ptinus imperialis*—by no means a domestic species, at least in Britain—is recorded by Ratzeburg, who says (Ichn. d. Forst. iii, 153) that Nördlinger bred this parasite at Hohenheim from old acacia posts together with *P. imperialis*. The latter also bred (*l. c.* ii, 152) *Eupelmus inermis* [280] from an ailing beech in which this beetle, among others, was dwelling.

45. *Dryophilus pusillus*, Gyll.

Brachistes interstitialis [236] (*l. c.* i, 54) and *Bothriothorax fumipennis* (iii, 194) were bred by Nördlinger at Stuttgart from, respectively, dry spruce twigs and a larch branch, in which *Anobium pusillum* was boring.

46. *Anobium*.

Westwood says (Mod. Class. ii, 159), "I have observed *Perilampus angustus* [287] on palings perforated by *Anobia*." Ratzeburg quotes this, and adds *Entedon confinis* from France (Ichn. d. Forst. i, 66), a ♂ *E. longiventris* in a German fir twig, *Xorides cryptiformis* (iii, 115) and *Hemiteles palpator* [27] of which Wissmann cut several out of oak bark

in which *Anobii* had probably lived (ii, 130); *Lissonota arvicola*[71] was bred by the same observer (ii, 98 et iii, 98) from beech logs inhabited by *Anobii* and *Ptilini*; and numerous *Taphæus fuscipes*[262] were found on old worm-eaten wooden bathing-houses (*l. c.* iii, 60) whence they were conjectured to have emerged from *Anobii* by Brischke, who once took *Diospilus capito* in abundance on old wood, probably from the same host (Schr. Nat. Ges. Danz. 1880, p. 123). Marshall gives *Calyptus tibialis* (Bracon. d'Europ. ii, 149) as another "parasite supposé" of this genus.

47. *Anobium domesticum*, Fourc.

Bracon spathiiformis[173] was certainly bred from *Anobium striatum* in hazel, by Nördlinger in France (Ichn. d. Forst. ii, 37). It is possible that this parasite—which is Haliday's *Doryctes obliteratus*, Ent. Mag. iv, p. 44 (*nec* Nees et Wesm.)—was really *Spathius clavatus*,[147] Panz., mentioned by Brischke (Schr. Nat. Ges. Danz. 1880, p. 137), "aus Larven von *Anobium striatum* erzogen." Bouché certainly bred the latter from this host, and Mr. A. J. Chitty has recently bred several *Doryctes spathiiformis* at Huntingfield in Kent from dead whitethorn sticks containing *A. domesticum* and *Priobium castaneum*. Rev. W. F. Johnson has recorded (E. M. M. 1901, p. 15) *Spathius exarator*, Linn., on Morley's authority, as commonly parasitic on *A. domesticum* in the central pillar of a large rosewood table, in Ireland; and Marshall also indicates the same host. Wissmann bred *Hemiteles modestus*[18] from *A. striatum* in old woodwork (Ichn. d. Forst. ii, 129 et iii, 154), as well as *Rogas collaris*[252] (*l. c.* ii, 66); and the association of *Hemiteles bicolorinus*, Grav., is suggested by Morley (Ichn. Brit. ii, 131). Donisthorpe bred a Chalcid at Rye in August 1902, from the burrows of this beetle. Mr. A. Sich took a ♀ of *Spathius exarator*, Linn., investigating the burrows of *A. domesticum* at Chiswick on 14th August, 1906.

48. *Anobium* (*Ernobius*) *angusticolle*, Ratz.*

Marshall simply says of *Aspidogonus abietis*, Ratz. (Bracon. d'Europ. ii, 253), "Il habité les pommes de pin, en société avec les *Anobium abietis*, Fab., et *angusticolle*, Ratz.," which, however, certainly points to parasitism; especially since Wissmann (Ichn. d. Forst. ii, 69), who actually bred it, expresses no doubt upon the subject.

49. *Anobium paniceum*, Linn.

At Hohenheim Nördlinger bred a ♀ *Eulophus pilicornis*, probably from this host, upon which are also said to prey (Ichn. d. Forst. ii, 154 et 211) *Entedon longicentris* and perhaps *Pteromalus brevicornis*.

50. *Anobium denticolle*, Panz.

Morley states (Ichn. Brit. ii, 133) that Mr. Donisthorpe has found *Hemiteles areator*, Panz., in the burrows of *A. denticolle* in England, in March; it may, however, have been no more than hibernating therein.

51. *Anobium consimile*, Muls. (? *Ernobius mollis*, Linn.)

52. *Anobium* (*Ernobius*) *longicorne*, Sturm.*

In Dr. Giraud's paper on Eclosions d'Insectes (Ann. Soc. Fr. 1877, p. 419), Laboulbène tells us that M. Perris bred *Eusandalum inerme*, Ratz., from both *Anobium consimilis* and *A. longicorne*, and earlier (p. 415) that *Spathius anobii*,[148] Gir., was also raised from the latter host, together with (p. 411) *Eubadizon brevicaudis*, Gir.

53. *Anobium rufipes*, Fab.*

Sigalphus aciculatus[188] is said by Ratzeburg (Ichn. d. Forst. iii, 249) to prey upon this species.

54. *Anobium pertinax*, Linn.*

Marshall (Bracon. d'Europ. i, 194) gives this species as an alternative host of *Spathius exarator*, Linn.

55. *Trypopitys carpini*, Herbst.*

From this host, Ratzeburg (Ichn. d. Forst. ii, 211) says that he raised his *Microgaster rufilabris*.

56. *Ernobius abietis*, Fab.

The following species are indicated as having been bred from *Anobium abictis* (Ichn. d. Forst. ii, 211 et iii, 249): *Pimpla strobilorum*,[42] *Aspigonus abictis*,[256] *Brachistes punctatus*,[238] *Bracon scutellaris*, *Pteromalus Hohenheimensis*, *P. strobilobius* and, doubtfully, *Ephialtes glabratus*. Of these Nördlinger bred in Würtemburg both sexes of *Asp. abictis* from fir cones infested especially by this beetle and, in a lesser degree, by *Tortrix strobilana*; Saxesen bred it in the

Hartz; and Wissmann expressly states that he "bred it from *A. abietis* and *angusticolle*"; Reissig, however, who has bred it most frequently, asserts it to prey upon the above *Tortrix*; Ratzeburg believed it was parasitic upon both the Lepidopteron and Coleoptera (*lib. cit.* i, 56 et ii, 69). Nördlinger also bred the *B. punctatus* twice singly at Hohenheim (ii, 28 et iii, 244) from spruce cones along with *Anobium abietis*. Giraud, too (Ann. Soc. Fr. 1877, p. 412), bred *Aspigonus abictis*, Ratz., from "*Anobium abictis*, dans cônes du sapin," as well as (p. 427) *Anogmus abictis*, Gir.

57. *Ptilinus pectinicornis*, Linn.

Curtis first (B. E. pl. dvii) bred his *Hecabolus sulcatus* from this beetle. Ratzeburg found (Ichn. d. Forst. ii, 215) it was preyed upon by his *Hemiteles completus* which Reissig (*l. c.* 130) bred from this beetle in poplar in the middle of May, *Eupelmus inermis*[280] and, perhaps, *Lissonota arvicula*,[71] *Polysphincta elegans*, *P. soror*, with *Xorides cryptiformis*. None of these were raised from it by Giraud (Ann. Soc. Fr. 1877, pp. 415 et 419), who says *Spathius clavatus*,[147] Panz., and *Halticella rufipes*, Oliv., attack it. The original parasite, *H. sulcatus*, Curt., was again bred from it by Brischke (Schr. Nat. Ges. Danz. 1880, p. 136); and Wissmann (Ichn. d. Forst. ii, 35) bred a great number of ♂ ♂ only, which were even more like Curtis's illustration than those from *Ptilinus costatus*. Haliday (Ent. Mag. iv, p. 49) bred it from the same host.

58. *Ptilinus costatus*, Gyll.*

A male and two females of *Bracon* (*Hecabolus*) *sulcatus* were taken by Hartig on willows in the act of investigating the borings of this beetle (*l. c.* ii, 34); and Reissig bred a single specimen of *Pteromalus distinguendus*, Först., from the same host (iii, 233) in poplar wood.

59. *Ochina hederæ*, Müll.

Writing of this species (Mod. Class. i, 272), Westwood tells us: "A. Cooper, Esq., R.A., has informed me . . . that it is preyed upon in the larva state by *Cleonymus depressus*." Wissmann repeatedly bred *Spathius erythrocephalus* from *Anobium Hederæ* (Ichn. d. Forst. ii, 43); Nördlinger bred both sexes of *Sigalphus aciculatus*[188] from

this beetle at Grand Jouan, in France (ii, 27); together with *Sigalphus facialis*, from old ivy stems (iii, 27), and quantities of *Bracon sulcatus*[157] (iii, 32); *Pteromalus elongatus* was also bred by him at Ludwigsberg from ivy stems along with the same host (iii, 244). *Spathius claviger* is recorded (Ann. Soc. F. 1877, p. 415) upon Perris' authority from *Blastophagus hederæ* by Giraud; and *Ochina ptinoides* is given by Marshall (Bracon. d'Europ. i, 207) as a host of *Hecabolus sulcatus*, Curt.

60. *Mesocœlopus niger*, Müll.

The host of *Pteromalus Opisthotonus*[358] has not been bred anywhere else, says Ratzeburg (Ichn. d. Forst. ii, 194); according to Reissig it is *Xyletinus murinus*; and the parasite emerged on 11th June, from an old woody fungus on oak.

61. *Dorcatoma dresdensis*, Herbst.*

Nees says of *Bracon ephippium*[259]: "E larvis Dorcatomæ Dresdensis, Boleto igniario nutritis, *Siekershusi*, mense Maio *mares* et *fœminæ* exclusi sunt" (Hym. Ichn. aff. Mon. i, 65). This is quoted by Kirchner (Cat. 132) and Marshall (Bracon. d'Europ.).

62. *Dorcatoma setosella*, Muls.

From *Dorcatoma setosella*, Laboulbène records (Ann. Soc. Fr. 1877, p. 435) the curious *Cephalonomyia formiciformis*, Westw.

63. *Sinoxylon sexdentatum*, Oliv.*

Upon the authority of Perris, Giraud (*lib. cit.* p. 435) gives *Cephalonomyia formiciformis*, Westw., as parasitic upon this beetle.

64. *Bostrychus capucinus*, Linn.

Perris tells us vaguely (Ann. Soc. Fr. 1850, t. viii, p. 565) that *Apate capucina* is attacked by some Braconid, which he was unable to determine.

65. *Xylopertha sinuata*, Fab.*

Apate sinuata and *Eccoptogaster intricatus* were both thought by Ratzeburg (Ichn. d. Forst. ii, 187) to be parasitised by *Pteromalus bimaculatus*; a large specimen of which emerged from an oak stick containing larvæ of the above beetles. He also queries (ii, 211) *Helcon carinator* as preying upon *Bostrychus sinuatus*.

66. *Lyctus canaliculatus*, Fab.

Dalman, according to Westwood (Mod. Class. ii, 159), always observed *Perilampus micans* upon posts which had been perforated by this species; but no direct association appears to be established, although Ratzeburg (Ichn. d. Forst. i, 23 et ii, 215) and Stephens (Illust. Suppl. 8, on *L. oblongus*) refer to the same subject. Giraud, however (Ann. Soc. Fr. 1877, p. 419), says he has bred *Eusandalum inerme*, Ratz., from this beetle. Mr. E. A. Newbery sent me in July (18, vii, '01) two ♀ ♀ *Eubadizon pallidipes*, Nees, "taken in Middlesex, while intruding their long spiculæ into the burrows of *L. canaliculatus* in an oak fence" [C. M.]. Bignell also records this parasite (Trans. Devon. Assoc. 1901, p. 682) "busy depositing eggs in a wood-boring beetle, infesting oak fencing," in London; this probably also applies to the present Coleopteron, since Mr. Newbery informs us he sent the latter some of these parasites. We have received from Mr. E. C. Bedwell two ♀ ♀ *Eubadizon pallidipes*, Nees, which "with others were running about on an old park paling fence at Ashstead in Surrey, which was riddled with borings of *Lyctus canaliculatus*; they seemed to run from hole to hole, some of which they partly entered. The *Lyctus* was abundant at the time"; 24th June, 1905.

67. *Lyctus brunneus*, Steph.

Eubadizon pallidipes, Nees, has also been captured by Mr. Donisthorpe, in the act of ovipositing in the burrows of this beetle, at Southfields, in 1904.

68. *Cis bolcti*, Scop.

P. F. Bouché describes, in his Naturgeschichte der Insecten (1834, p. 149), a parasite of this species under the name *Bracon cis*—referred to by Westwood (Mod. Class. ii, 143). This Nees synonymised with *Metcorus atrator*, Curt.; but Marshall (Bracon. d'Europ. ii, pp. 96 et 119) thinks it certainly referable to *M. profligator*, Hal., of which Bignell (Trans. Devon. Assoc., 1901, p. 682) bred nine examples from the larvæ of this Coleopteron, in *Polyporus versicolor*, early in August 1885. *M. filator*, Hal., is also sometimes found abundantly in the same kind of fungus, though no association with *C. bolcti* has yet been suggested.

69. *Cis laminatus*, Mel.*

The only parasite upon this species is *Cephalonomyia formiciformis*, recorded by Dr. Giraud (Ann. Soc. Fr. 1877, p. 435).

70. *Cis glabratus*, Mel.*

71. *Ennearthron affine*, Gyll.

From both these small species, Dr. Laboulbène records (*l. c.* p. 431) the Chalcid fly, *Astichus arithmeticus*, Först., upon the authority of M. Perris, in France.

72. *Prionus coriarius*, Linn.

MM. Dr. Jacobs and Dr. Tosquinet, in their Catalogue des Ichneumonides de la Belgique appartenant au Groupe des Pimplides, indicate (p. 320) *Xorides albitarsus* as having been observed to be parasitic upon this fine Coleopteron by Dr. Fromont.

73. *Cerambyx*.

From unspecied individuals of this genus, *sensu lato*, Ratzeburg records *Ephialtes populneus*, of which Herr Zebe bred a ♂ from poplar and probably from the *Cerambyx* larvæ therein (Ichn. d. Forst. ii, 100); Nördlinger bred *Ephialtes tuberculatus* from a Longicorn in oak at Nozay (*l. c.*); *Polysphincta lignicola* is also thought to be bred from some *Cerambyx* (iii, 110) and *Xorides appendiculatus*[86] from the larger *Cerambycidæ* (ii, 108). *Bracon bicellularis* was bred by Nördlinger from elm-wood in which small Longicorns were living (iii, 33), and *B. flavator* "also lives on *Cerambyces* in dry wood" (i, 46). *Mesoleptus teredo*,[1] whose cocoon was found in a beetle's boring together with the remains of a dead *Cerambyx* larva (ii, 119), and *Xorides crassipes*, also prey on these beetles; the other kinds, indicated by Ratzeburg at Ichn. d. Forst. i, 23, are specified at ii, 212.

74. *Cerambyx heros*, Fab.

Ephialtes carbonarius, Christ., is said by Ratzeburg (Ichn. d. Forst. iii, 109 et 249) to prey upon this large species.

[1] An entirely neglected species; described by Hartig, Bericht d. naturw. Verein der Harz. 1846–7, p. 16.

75. *Aromia moschata*, Linn.

The larvæ of the Musk Beetle are said by Brischke (Schr. Nat. Ges. Danz. 1880, p. 129) to be destroyed by *Ischnoceros rusticus*, Grav., which he considers synonymous with *Odontomerus cornutus*, Ratz. Thomson says that his *Ephialtes heteropus* (Opusc. Ent. 1249) was bred from this longicorn at Lund.

76. *Hylotrypes bajulus*, Linn.

From fir-wood in which *Cerambyx bajulus* had bored, Ratzeburg (Ichn. d. Forst. iii, 140) bred *Cryptus minator*. Bouché also found *Ephialtes manifestator* in this beetle (i, 119 et ii, 119); but *Bracon leucogaster*[172] is said to be by far its commonest parasite, and has been found—in Germany—in and upon dry wood, especially in beams of houses, about its borings (*l. c.* iii, 35 et Marsh., Bracon. d'Europ. i, 234).

77. *Callidium.*

Herr Wissmann bred several *Aspigonus diversicornis*[255] in Germany from very different insects, but all in dead wood—*Lymexylon dermestoides*, *Mycetochara linearis* and unspecified *Callidia* (Ichn. d. Forst. ii, 69). Marshall says that this Braconid (Bracon. d'Europ. ii, 252) has been bred "d'un longicorne non determiné."

78. *Callidium alni*, Linn.

There is a ♀ specimen of *Pimpla instigator* in Morley's collection taken by Mr. E. C. Bedwell at "Westerham, 4. 6. 1900, sitting on a post, which was full of *Callidium alni*." No parasitism is, however, suggested, for which indeed the Ichneumonid appears much too large.

79. *Callidium sanguineum*, Linn.

Ratzeburg tells us (Ichn. d. Forst. i, 123) that he found *Cerambyx sanguineus* upon several occasions preyed upon by *Xorides præcatorius*[77] in hornbeam logs; and this is confirmed by Prof. Thompson (Opusc. Ent. viii, 775), who says of the latter, "Utkläckt ur *Callidium* i Lund." Giraud (Ann. Soc. Fr. 1877, p. 411) gives *Opius* ? *caudatus*, Wesm., as parasitic on this Longicorn, upon Perris' authority. Marshall (Bracon. d'Europ. i, 228) has no doubt that it is further attacked by *Dorycles gallicus*, Reinh., and adds, "Il

est très probable aussi que le *Bracon truncorum*, Goureau, élevé du même *Callidium*, est identique avec le *D. gallicus*."

80. *Callidium variabile*, Linn.

Of *Xylonomus præcatorius*, Fab., Brischke writes (Schr. Nat. Ges. Danz. 1880, p. 128): "Aus *Callidium variabile* erzogen." Goureau gives his insufficiently described *Spathius ferrugatus* as preying upon the same beetle; and Marshall says of *Helcon carinator*: "Elevé par Ratzeburg d'une larve du longicorne *Callidium variabile*, L., trouvée dans une ramuscule de chêne."

81. *Callidium violaceum*, Linn.

From the larvæ of various *Cerambyces*, but especially of this common species, Ratzeburg says (Ichn. d. Forst. ii, 68) that Wissmann bred both sexes of *Helcon carinator*, Nees, and also, probably, *H. tardator*, Nees; and adds (*l. c.* ii, 70) that he has bred *Aspigonus contractus*,[254] with *Helcon æquator*, out of spruce-wood infested by this Longicorn. Mr. Horace Donisthorpe possesses a ♀ *Ephialtes carbonarius*, which he took in the act of ovipositing in the burrows of *C. violaceum* at Lyndhurst, in 1902.

82. *Clytus*.

Herr Reissig bred *Exotheeus lævigatus*[119] from an unspecified larva of this genus (Ichn. Forst. iii, 43); eight of this parasite's larvæ were found to be externally sucking that of the Longicorn and they subsequently spun light cocoons. Radzay also bred *Spathius Radzayanus* (*l. c.* ii, 44) from oaks in which several species of *Clytus*, together with other beetles, had been boring.

83. *Clytus arcuatus*, Linn.

M. Perris has raised the very rare Pimplid, *Arotes albicinctus*, Grav., from this species (cf. Laboulbène, Ann. Soc. Fr. 1877, p. 406); and Ratzeburg gives (Ichn. d. Forst. iii, 249) *Exotheeus lævigatus*[119] as parasitic upon *Cerambyx arcuatus*. [Cf. also *Agrilus biguttatus*, ante.]

84. *Molorchus umbellatarum*, Linn.

The only parasite which has been indicated in connection with this species is *Ephialtes pusillus*, Ratz. (Ichn. d. Forst. iii, 110), of which one specimen was bred by Nördlinger out of *M. umbellatarum* in apple-wood.

85. *Rhagium bifasciatum*, Fab.

There are, curiously enough, no records of hymenopterous parasites of this common species. In April 1900 Mr. F. H. Day sent from the Carlisle district (Orton and Durdar) to Mr. Morley both sexes of *Mitroboris cornuta*,[76] Ratz., with the following note: "They were bred from fir logs, in which *Rhagium bifasciatum* was feeding; I have just bred another pair from cocoons—the cocoons from which *Mitroboris* emerged were their own and not those of *Rhagium*; taken 18th March, 1900. I fancy it is not uncommon here, having during the last few years repeatedly noticed similar cocoons in the *Rhagium* burrows."

86. *Rhagium indagator*, Fab.

Ratzeburg (Ichn. d. Forst. ii, 212) says this northern species is preyed upon in the Hartz Mountains by *Xorides irrigator*[78] (ii, 105)—copied by Taschenberg (Zeits. Ges. Nat. 1863, p. 300) and Tosquinet (Ann. Soc. Belg. 1897, p. 322)—*Spathius Radzayanus* whose cocoons were found in its burrows (ii, 43) and *Bracon leucogaster*[172] which was bred from it by Bouché (i, 45); this last is probably synonymous with *Cœloides initiator*, Fab., which Marshall records (Bracon. d'Europ. i, 222) from the same host, whence Bouché also bred *Bracon initiator*.

87. *Rhagium inquisitor*, Fab.

This common species is preyed upon by another kind of *Xorides, filiformis*,[79] according to Wissmann (Ichn. d. Forst. ii, 105—copied like the last species), who notes that the parasite constructs a disproportionately elongate cocoon and is not confined to the present host.

88. *Rhagium mordax*, Fab.*

Brischke writes (Schr. Nat. Ges. Danz. 1880, p. 129), under *Ischnoceros rusticus*, Grav., "Aus Larven von *Rhagium mordax* . . . . erzogen."

89. *Leptura scutellata*, Fab.

Both sexes of *Histeromerus mystacinus* have been bred by Mr. Horace Donisthorpe, from a mass of their own cocoons, which emerged from a cocoon of *L. scutellata*, found in Epping Forest in May 1906.

90. *Strangalia quadrifasciata*, Linn.

Marshall's record (Bracon. d'Europ. ii, 219) of *Helcon ruspator*, Linn., "Parasite du longicorne *Strangalia quadrifasciata*, L.," is the only one known.

91. *Grammoptera ruficornis*, Fab.

Morley, confirming *Helcon annulicornis*, Nees, as British (E. M. M. 1900, p. 175), writes: "I should suspect it, from the state of its environment when found in the present instance," to prey upon "*Grammoptera ruficornis*, F., . . . If, however, it be parasitic upon so ubiquitous a host, it appears curious that it should for so long have been overlooked." And, moreover, the relative size of host and parasite render such an association highly improbable.

92. *Acanthocinus ædilis*, Linn.

Xorides filiformis[79] under fir bark (Ichn. d. Forst. i, 123), *X. irrigator*[78] of which the almost black and boat-shaped cocoon was found side by side with that of its host in dry wood (iii, 105), and *Bracon initiator*[162] (i, 46 et ii, 39) are instanced as parasites of this interesting Longicorn by Ratzeburg (ii, 212), to which is somewhat doubtfully added (iii, 36) *Bracon præcisus*,[169] upon the authority of Brischke, who saw on 23rd May six of these parasites emerge from a hole of *Cerambyx ædilis* in a fence post.

93. *Leiopus*.

Giraud indicates an unspecified individual of this genus to have been the host of *Orthocentrus fulvipes*, Grav. (Ann. Soc. Fr. 1877, p. 408); it was bred in France by M. Edouard Perris.

94. *Leiopus nebulosus*, Linn.

From this species has been bred by Dr. Fromont, according to Tosquinet (Ann. Soc. Belg. 1897, p. 322), *Mitroboris cornuta*,[76] Ratz.; and Laboulbène also says (Ann. Soc. Fr. 1877, p. 411) that *Metcorus tabidus*, Wesm., was raised from it by Perris.

95. *Hoplosia fennica*, Payk.*

From *Cerambyx fennicus*, Ratzeburg records (Ichn. d. Forst. ii, 212) *Ephialtes tuberculatus*, *Xorides filiformis*[79] bred by Reissig from its own brown, papyraccous cocoons

of nearly an inch in length from this beetle in dead wood (ii, 105), *Helcon carinator* and, doubtfully, *Helcon tardator*. Of *H. carinator* he says (ii, 68): "I bred 6 ♂ ♂ and 2 ♀ ♀ from an oak bough in which the otherwise rare *Apate sinuata*, with *Eccoptogaster intricatus* and *C. fennicus* had bored extensively; of *C. fennicus* only one beetle emerged; either the *Helcon* attacked this species only, or at the same time the somewhat large *Apate*." Marshall, however, has not noticed this parasitism under either species of *Helcon*.

96. *Exocentrus lusitanus*, Linn.*

Brischke appears to have paid considerable attention to the parasites of this species, for, in his "Die Ichneumoniden der Provinzen West- und Ost-Preussen," he records *Cœnocryptus tener*, *Ephialtes discolor*, *Spathius brevicaudis* and *Trigonoderus dactilis*, as preying upon it.

97. *Exocentrus punctipennis*, Muls.*

A Braconid, under the name *Blacus exocentri*, Gir., is recorded by Laboulbène (Ann. Soc. Fr. 1877, p. 411) as having been bred from this species by Perris in France.

98. *Exocentrus adspersus*, Muls.*

Laboulbène (*lib. cit.* p. 419) instances the Chalcid, *Eusandalum inerme*, Ratz., as parasitic on this Longicorn.

99. *Pogonochærus fasciculatus*, DeG.

Bracon flavulator, one ♂ from fir billets (Ichn. d. Forst. i. 46), *Ephialtes carbonarius*, *Pimpla terebrans*, *Pteromalus Dahlbomii*, two ♂ ♂ taken out of this host upon different occasions (i, 202) and a single pair of *P. Pogonochoeri*, from fir billets in which this beetle had lived (i, 200), are recorded from *Cerambyx fascicularis*, Panz., by Ratzeburg (ii, 212); and to these are added (iii, 249) *Bracon igneus*,[170] several bred from fir boughs in which were these beetles, *B. undulatus*[174] and *B. palpebrator*, from the same host; the last-named parasite was several times bred in great numbers by Reissig from *P. hispidus*, Linn. (iii, 38). Reinhard obtained four ♂ ♂ and twelve ♀ ♀ of his *Dorycles pomarius* from the borings of *Pogonochærus fascicularis*, Panz., *Scolytus rugulosus* and *S. pruni* in fruit trees, as recorded by Marshall and Kirchner.

100. *Pogonochærus bidentatus*, Thoms.

From *P. hispidus*, Laich., Perris bred in France (cf. Ann. Soc. Fr. 1877, pp. 410–11) *Odontomerus spinipes*, Grav., *Opius rubriceps*,[264] Ratz., and, doubtfully, *O. caudatus*, Wesm. Nördlinger also bred, in Germany, one ♀ of *Bracon undulatus*,[174] from apparently this species, out of *Euonymus* (Ichn. d. Forst. iii, 35).

101. *Pogonochærus dentatus*, Fourc.

Ratzeburg says (*l. c.* ii, 212) that *Cerambyx pilosus*, Fab., is attacked by *Ephialtes carbonarius* (i. 119), and perhaps also by *Pimpla terebrans*, which he bred from fir billets probably containing this beetle (i, 114), and from some six-to-eight-year old dead firs containing a quantity of *Pogonocherus* larvæ (ii, 89).

102. *Monochammus sutor*, Linn.

Bracon impostor is given by Ratzeburg (*l. c.* iii, 249) as parasitic upon *Cerambyx sutor*.

103. *Dorcadion pedestre*, Poda.*

The same author instances *Cerambyx rufipes* as the host of *Xorides* (*Echthrus*) *crassipes*, which Jacobi bred at Nordhausen, in April, from this species, feeding in dry plum-tree branches (*l. c.* iii, 115 et 249).

104. *Saperda carcharias*, Linn.

Xorides (*Mitroboris*) *cornutus*,[76] Ratz., is the only known parasite of this species as instanced by its author, Taschenberg and Tosquinet. Kielmann took at Haasenfelde (Ichn. d. Forst. ii, 108) three ♀ ♀ as they crept in and out of the holes bored by *Cerambyx carcharias* in aspen stems.

105. *Saperda populnea*, Linn.

This Longicorn is much subject to Hymenopterous parasites: *Ephialtes continuus*, twice bred by Brischke from swellings on aspen twigs caused by the larvæ of this beetle (Ichn. d. Forst. iii, 25 et 109), *E. manifestator* and *E. populneus*, one ♂ of which was bred by Lebe from poplar but uncertain host (ii, 100); *Bracon multiarticulatus*, *Chelonus lævigator* [194] from the same swellings as *E. continuus* (iii, 25), *Alysia Gedanensis*, [270] bred by both

Reissig and Brischke from swollen aspen twigs containing these larvæ in May, June and July (iii, 70); *Pteromalus æneicornis*, several raised by Brischke out of aspen swellings whence the *A. Gedanensis* had already emerged (iii, 228); with, doubtfully, a single *Entedon chalybæus* from a similar larval swelling in poplar by Reissig, and *Torymus macrocentrus* by Nördlinger at Stuttgart out of similar knots in a weak aspen (iii, 224);—were all noted from *Cerambyx populneus* by Ratzeburg (*lib. cit.* ii, 212 et iii, 249); as also was said by Brischke to have been *Ichneumon suspicax*[2] (iii, 166), but Morley regards this (Ichn. Brit. i, 248) as "almost certainly in error," and adds (*l. c.* 292), "a great deal more proof is needed before any reliance can be placed upon the records of any Ichneumoninæ preying upon Coleoptera." Tischbein once saw *Glypta teres*,[70] Ratz. [*nec* Grav.: cf. Thoms., Opusc. Ent. xiii, 1340] swarming round an aspen and several times bred the same species from the present Longicorn. Brischke, in his Prussian Ichneumons, also gives *Ephialtes continuus*, *Ascogaster lævigator* [194] and *Entedon chalybæus*, adding *Diadromus subtilicornis* with a query. Giraud records (Ann. Soc. Fr. 1877, p. 397 *et seqq.*) *Cryptus analis*,[31] *Ephialtes tuberculatus*, *Pimpla alternans*, *Echthrus nubeculatus*, *E. populneus*, Gir., and *Bracon denigrator*,[167] Fab., as preying upon it. Kirchner (Cat. 119) adds *Chelonus nigrinus* and Tosquinet (Ann. Soc. Belg. 1897, p. 280) *Ephialtes carbonarius*, upon Taschenberg's authority. Bridgman says (Trans. Norf. Soc. 1893, p. 629) that Mr. H. J. Thouless has bred both *Ephialtes imperator* and *E. tuberculatus* from this Longicorn in Norfolk.

106. *Saperda scalaris*, Linn.

According to Dr. Laboulbène (Ann. Soc. Fr. 1877, p. 405), Perris bred *Campoplex transfuga*,[103] Gir., *Orthocentrus fulvipes*, Grav., and *Meteorus tabidus*, Wesm., from this species; from which has also been raised (Ann. Soc. Belg. 1897, p. 322) by Dr. Fromont *Xylonomus filiformis*, Grav., in Belgium. Nördlinger also bred both sexes of *X. præcatorius* (Ichn. d. Forst. iii, 115) from a *Cerambyx*[1] in maple.

[1] Ratzeburg (*loc. cit.*) calls this beetle *Cerambyx luridus*; I fancy, however, it is really *Saperda scalaris*, as *Tetropium luridum* lives in *Coniferæ*.—E. A. E.

107. *Tetrops præusta*, Linn.

From this small species, Ratzeburg (Ichn. d. Forst. ii, 212) records *Elachestes leucogramma*, *Pteromalus nodulosus*, of which Brischke bred a single ♂ (ii, 197) and, doubtfully, *Eurytoma Eccoptogastri*. Nördlinger also bred several specimens of *Eurytoma ischioxanthus* from ash and some others from a dry ash point, ringed by hornets, in which were *Cerambyx præusta*. Under the genus *Acrocormus*, Först., Kirchner (Cat. 166) writes: "Dr. Förster entdeckte 2 Arten aus dürren Appelzweigen, worin die Larven von *Saperda præusta* von einer *Thamnophilus*—und *Scolytus*—Art lebten."

108. *Oberea oculata*, Linn.

Taschenberg and Tosquinet both give *Ephialtes carbonarius*, Christ., as preying upon this handsome species. They copy Ratzeburg, who says (Ichn. d. Forst. ii, 99): "Among others, I bred a 5½ lines long ♂ with stramineous under-side of scape, rust-red clypeus, beautifully silky face and remarkably short legs out of *Salix caprea*, in which *Saperda oculata* had been boring." The parasitism, however, is not established, and the short legs render the identification doubtful.

109. *Tetropium luridum*, Linn.

This species is said to be much infested with *Xorides ater*[80] in Silesian spruce-fir trees, *X. collaris*, a ♂ of which were bred byWissmann in the Hartz, *Aspigonus contractus*,[254] *Bracon initiator*,[162] *B. obliteratus*,[175] a few untypical ♀♀ of *Helcon æquator* and both sexes in fir in the Hartz, and, doubtfully, *Mesoleptus teredo*, by Ratzeburg (*lib. cit.* ii, 39, 67 et 212). *Xylonomus caligatus*[35] is also instanced as parasitic upon it by Kirchner (Cat. 109) in Prussia.

110. *Tetropium castaneum*, Linn.

Morley writes (Ichn. Brit. ii, 21) of *Cubocephalus nigriventris*, Thoms.: "In July 1904, Donisthorpe gave me a female of this species, which he had 'dug at Market Bosworth, Leicestershire, from a burrow of *Tetropium castaneum*, in a spruce tree'; there was, however, no direct evidence of this species' parasitism upon the Longicorn coleopteron (cf. E. M. M. 1906, p. 41)." Mr. Pool has bred from *Tetropium gabrieli*, at Enfield in 1906, a ♂ *Lissonota*,

which appears to be the undescribed sex of *L. palpalis*, Thoms., and, if so, is new to the British Fauna.

111. *Bruchus affinis*, Fröh.

Curtis tells us (Farm Insects, 365) that *Sigalphus thoracicus* is parasitic upon *Bruchus flavimanus*.

112. *Bruchus atomarius*, Linn.

The same author (*lib. cit.* 364) instances *Sigalphus pallidipes* as preying upon *Bruchus granarius*. Kirchner (Cat. 115) and Marshall (Bracon. d'Europ. i, 254) say *Chremylus rubiginosus*, Nees, is a parasite of *B. granarius*, Schh.; from the larvæ of which in the pods of vetch M. Perris has also bred *Sigalphus striatulus*.

113. *Bruchus lentis*, Boh.

Marshall (*lib. cit.* i, 312) indicates *Sigalphus thoracicus*, Curt., as preying upon *Bruchus lentis*, Schk.

114. *Bruchus rufimanus*, Boh.

This species is also given by Marshall (*l. c.* i, 254) as an alternative host of *Chremylus rubiginosus*, Nees.

115. *Bruchus biguttatus*, Oliv.*

Bracon rufator, Giraud, was raised by its author (Ann. Soc. Fr. 1877, p. 414) from *B. biguttatus*, in France.

116. *Bruchus seminarius*, Linn.*

Both *Chremylus rubiginosus*, Nees, and *Sigalphus thoracicus*, Curtis, are given as parasitic upon this species by Marshall (Bracon d'Europ. i, 254 et 312).

117. *Bruchus viciæ*, Oliv.*

Edouard Perris, according to Laboulbène (Ann. Soc. Fr. 1877, pp. 414 et 429), bred *Bracon præcox*, Wesm., and *Pteromalus leucopezus*, Ratz., from this species in France.

118. *Bruchus villosus*, Fab.

Three Chalcids are instanced by Ratzeburg as preying upon *B. spartii*, Er. These are *Tridymus undatus*[309] and *T. punctatus*[311] (Ichn. d. Forst. iii, 227), the latter of which Reissig bred from the seeds of *Spartium scoparium*, together

with *Curculio Spartii*, and two ♀♀ of *Entedon seminarius* [383] (iii, 213). The latter was also bred by Brischke from the same host; from which Kirchner further says (Cat. 111) that *Bracon colpophorus* and *Pteromalus leguminum* have been bred. Reissig, however, was uncertain (Ichn. d. Forst. iii, 234) whether the host of *P. leguminum* were a *Bruchus* or an *Apion*.

119. *Bruchus rufipes*, Herbst.*

120. *Bruchus signaticornis*, Schh.

121. *Bruchus pallidicornis*, Schh.

M. Perris has indicated *Sigalphus striatulus* as parasitic upon the above three species of *Bruchus* in pods of vetch.

122. *Crioceris asparagi*, Linn.

Our evidence of this species' parasitism is of the slenderest: a single cocoon of some kind of *Apanteles* (which unfortunately failed to emerge) was found in June 1906, upon an asparagus leaf in the garden of Monks' Soham House, Suffolk, amongst numerous larvæ of this beetle [C. M.].

123. *Crioceris duodecimpunctata*, Linn.

Kirchner states (Cat. 98), concerning the Ophionid, *Porizon microcephalus*, Grav., "Von Dr. Amerling aus *Crioceris duodecimpunctata* erzogen."

124. *Cryptocephalus bipunctatus*, Linn.

M. Tappes has figured the male of *Pygostolus falcatus*, Nees, which he says (Ann. Soc. Fr., 1869) emerged from this beetle.

125. *Cryptocephalus fulvus*, Goez.

The Braconid, "*Pezomachus*" *Rosenhaueri*,[161] Ratz. (Ichn. d. Forst. ii, 247), has been bred in Germany by Herr Rosenhauer from larvæ of *Cryptocephalus minutus*, Fab.

126. *Cryptocephalus quinquepunctatus*, Har.*

Nees von Esenbeck reared two individuals of *Eupelmus annulatus* from the pupa of this beetle (Hym. Mon. ii,

76—quoted by Westwood, Mod. Class. ii, 159). This is copied by Ratzeburg (Ichn. d. Forst. iii, 249), who adds that *Pezomachus pedestris*,[13] a species of *Tryphon*, *Entedon cassidarum* and *Pteromalus cryptocephali*, which was bred by Rosenhauer, also prey upon this species; though all his details appear somewhat inconclusive.

127. *Timarcha tenebricosa*, Fab.

DeGeer first noticed this species to be attacked by hymenopterous parasites. Bignell bred (Trans. Devon. Assoc., 1901, p. 680) a specimen of *Perilitus falciger*, Ruthe, from a perfect beetle of this species in South Devon, on 7th May, 1891, and remarks upon the rarity of the emergence of parasites from imagines. For a similar record cf. Bull. Soc. Fr. 1854, p. 57.[1]

128. *Timarcha violacconigra*, DeG.

Writing of *Perilitus falciger*, Ruthe, Marshall (Bracon. d'Europ. ii, 42) tells us that "Un examplaire conservé au Museé Britannique est étiqueté comme provenu d'un coléoptère adulte et vivant, *Timarcha coriaria*, Fab."

129. *Chrysomela*.

Boyer de Fonscolombe bred (Ann. Scien. Nat., 1832, pp. 273 *et seqq.*) his *Pteromalus gallarum*[385] from the pupa of some species of this genus, as is quoted by Westwood and Ratzeburg.

130. *Chrysomela varians*, Schal.

Kawell is said by Kirchner (Cat. 97) to have bred from this beetle *Mesochorus thoracicus*, Grav., in Kurland.

131. *Melasoma populi*, Linn.

Chrysomela populi is said by Ratzeburg (Ichn. d. Forst. iii, 230 et 249) to be attacked by *Pteromalus Sieboldi*, which Reissig and von Siebold both bred from this beetle,

[1] "Several instances of the emergence of the larvæ from the bodies of perfect Coleopterous insects are recorded, and I possess a specimen of *Timarcha lævigata*, from which the larvæ of a small species of *Bracon* escaped from the posterior extremity of the abdomen in such numbers, as to cover the whole bottom of a pill-box an inch in diameter with their little cocoons. There could hardly have been fewer than a hundred of them, and the beetle did not long survive such an unpleasant operation" (Dallas' Elements of Entomology, p. 242).

probably from the pupa or full-grown larva. Cf. also J. Giraud, Bull. Soc. Fr. 1869, p. 147.

132. *Melasoma tremulæ*, Fab.

Referring to the earlier records of *Apanteles hoplites*, Ratz., Marshall (Bracon. d'Europ i, 443) writes: "Reissig a supposé, par erreur, qu'il était parasite des coléoptères . . . *Lina tremulæ*, Fab., obtenus des feuilles roulées du tremble." Marshall's scepticism is based upon the belief that no member of the genus preyed upon Coleoptera; but cf. Morley, Entom. 1906, p. 100.

133. *Gastroidea viridula*, DeG.

134. *Plagiodera versicolora*, Laich.

Kirchner says of *Pteromalus mandibularis*, Först. (Cat. 172): "Von mir erzogen aus *Plagiodera armoraciæ*, Fabr., und *Gastrophysa raphani*." Brischke records *Bracon fuscipennis*, Wesm., ♂ "Aus Larven von *Gastrophysa raphani* erzogen" (Schr. Nat. Ges. Danz., 1880, p. 135).

135. *Prasocuris phellandrii*, Linn.

In his splendid "Wirths-Tabelle," Brischke (*lib. cit.*, p. 176) gives "*Phitonomus phellandrii*" as the coleopterous host of *Canidia quinquecangularis*, Ratz. No such species appears to occur in the genus *Phytonomus* (*Hypera*), nor is such a one called to mind in any but *Prasocuris*; but cf. Thoms Opusc. Ent. xi, 112.

136. *Galeruella calmariensis*, Linn.

Westwood says (Mod. Class. ii, 159) that Fonscolombe reared *Pteromalus galeruæ* from the eggs of *Galeruca calmariensis*; but we have not seen the latter's account of the circumstance.[1]

137. *Adimonia pomonæ*, Scop.*

The ubiquitous *Bassus lætatorius* has been bred by Tischbein from the larva of *A. rustica* (cf. Voll. Pinac. iii, pl. 1, et Morley, Trans. Ent. Soc., 1905, p. 432).

[1] Cf. also P. Marchal's Observations biologiques sur un Parasite de la Gateruque de l'Orme, le *Tetrastichus xanthomelænæ*, Rond. [Bul. Soc. Fr. 1905, pp. 64–68.]

138. *Phyllotreta nigra*, ? MS.*

Under *Aphidius Halticæ*, Rond., Marshall (Bracon. d'Europ. ii, 616) writes: "Provenu, selon l'auteur, de la larve d'un coléoptère, qu'il nomme *Phyllotreta nigra*, Ent. Heft. Outre qu'il n'y a pas de *Phyllotreta nigra* parmi les Halticidæ, un rapport de parasitisme entre *Aphidius* et un coléoptère est peu vraisemblable.—Italie."

139. *Psylliodes dulcamaræ*, Koch.

Dr. Giraud, in a footnote (Ann. Soc. Fr. 1877, p. 248), says: "M. Edouard Perris a trouvé le *Pteromalus excrescentium* de Ratzeburg, parasite de la *Psylliodes dulcamaræ*."

140. *Cassida.*

Under *Entedon cassidarum*, Ratz., Kirchner (Cat. 184) gives: "Gezogen aus *Cassida*-Arten." It was bred by both von Siebold and Rosenhauer from members of this genus (Ichn. d. Forst. iii, 248).

141. *Cassida seladonia*, Gyll.

Laboulbène gives (Ann. Soc. Fr. 1877, p. 418) *Chalcis parvula*, Laporte, as having been bred by Perris from *C. flaginis*, Perr.

142. *Heledona agaricola*, Latr.

Of his ♀ *Orthocentrus testaceipes*, Brischke says (Schr. Nat. Ges. Danz. 1878, n. 6, p. 110): "Aus Larven der *Heledona agaricola* in einem *Boletus* erzogen. Neustadt." A dozen specimens, including both sexes, of a green *Pteromalus*, together with their hosts, were bred from this beetle by Donisthorpe in a fungus found at Virginia Water, 21st September, 1901.

143. *Diaperis boleti*, Linn.

Giraud found *Diospilus ephippium* associating with this beetle and other fungivorous Coleoptera in *Boletus ignarius* about Vienna (Bracon. d'Europ. ii, 263 et Kirch. Cat. 132). Laboulbène records *Microdus caleulator*, Nees (Ann. Soc. Fr. 1877, p. 412): "Bolet, avec *Diaperis boleti* et *Tinea parasitella*"; Marshall, however, thinks the *Microdus* more probably parasitic on the Lepidoptera, *Scardia boleti*, Fab., etc.

144. *Myctocharcs axillaris*, Payk.*

This species was thought by Ratzeburg (Ichn. d. Forst. ii, 69 et 215) to be preyed upon by *Aspigonus diversicornis*,[255] since the latter was bred in Germany by Herr Wissmann from dead wood containing *M. lincaris* and other Coleoptera. Marshall (Bracon. d'Europ. ii, 252) quotes this, but synonymises the host with *Myctocharcs barbata*, Latr.

145. *Orchesia minor*, Walk.

From the pupa of this species, which is probably synonymous with the next, Marshall says *Euphorus pallidipes*, Curt., has once been bred in England.

146. *Orchesia micans*, Panz.

The pink larvæ of this beetle, so abundant in dry *Boleti*, are very extensively parasitised, though it is difficult to understand how their foes come at them when so embedded in their pabulum. Westwood (Mod. Class. i, 309 et ii, 143) says M. V. Adouin has ascertained that it was attacked by *Perilitus similator*,[218] which he himself had also reared from it. Curtis instances *Euphorus orchesiæ*[210] and *Meteorus orchesiæ*.[217] Ratzeburg (Ichn. d. Forst. ii, 215) gives *Microdus abcissus*[207] (p. 46), *Porizon moderator*,[106] of which Tischbein bred both sexes (p. 86), *Perilitus obfuscatus*,[217] bred by Reissig, Tischbein and Wissmann, and *P. longicaudis*, also bred by Wissmann along with the last species, as its parasites; and *Meteorus longicaudis* is also referred to in this connection by Brischke. Giraud bred *Meteorus obfuscatus*, Ratz., from "*Orchestes micans*, dans *Boletus igniarius*" (Ann. Soc. Fr. 1877, p. 411). Marshall records (Ent. Ann. 1874, p. 126) *Perilitus obfuscatus*, Nees, bred from this beetle and (Bracon. d'Europ. ii, 91) says of *M. obfuscatus*: "Ce *Meteorus* est bien connu comme parasite solitaire et commun des coléoptères fungicoles, *Orchesia micans*, Panz., etc. On ignore si la femelle confie son œuf à la larve de *l'Orchesia* ou à l'insecte adulte; quoi qu'il en soit, j'ai vu plusieurs fois des *Orchesia* à l'état parfaits, trouvés mort, et ayant leurs membres enchevêtrés dans le lainage de la coque blanchâtre du parasite, qui s'était attaché à leur ventre." Bignell (Trans. Devon. Assoc. 1901, p. 681) also notices the attachment of the parasites' thin and whitish cocoon to their host in Bolt Head speci-

mens of the same species; he bred it at the end of June 1898. Sometimes only ♂♂ will emerge from a whole fungus-full of *Orchesia*, as was the experience of Mr. E. G. Bayford, about Barnsley in 1898, who bred it from the pupæ of the beetle. It has been suggested that this species may have been the host of *Hemiteles niger*, which has been bred from a ligneous fungus (cf. Morley, Ichn. Brit. ii. 146).

Morley has invariably bred *Meteorus obfuscatus*, wherever *O. micans* occurs (from *Boletus* on old elm-trees about Ipswich); a fungus taken on Oct. 17th, 1897, produced 5 ♂ and 2 ♀ *Thersilochus moderator* on April 1st, 1898; and 1 ♂ with 3 ♀♀ of the same species, 8 ♂ and 13 ♀ *Meteorus obfuscatus*, and 19 *O. micans*, had also emerged from it by Jan. 12th, 1901. A second fungus, taken Dec. 30th, 1899, yielded only 2 ♀ *M. obfuscatus* and 2 *O. micans* by June 22nd, 1900. From a third fungus obtained in 1902 were bred by June 17th, 1903, 26 *O. micans*, 50 (17 ♀♀) *M. obfuscatus*, 10 (5 ♀♀) *T. moderator*, 5 (1 ♀) *Proctotrypes parvulus*, Hal., 2 red-bodied *Cecidomyia* and 1 *Phalacrus corruscus*; there can be but little doubt, in lack of direct evidence, that the *Thersilochus* is hyperparasitic, through the *Meteorus*, upon the *Orchesia*; the appearance of the *Proctotrypes* is more difficult to explain, though several times before bred from fungi; the Dipteron doubtless subsisted upon the fungus itself, in which the Phalacrid Coleopteron was probably no more than hibernating.

147. *Hallomenus.*

Prof. C. G. Thomson (Opusc. Ent. xiii, 1360) says of *Porizon*: "Hvad angår lefnadssättet känner man föga derom; ett par arter hafva kläckts ur Coleoptera—*Orchesia* och *Hallomenus*—; några andra lefva parasitiskt hos *Cynips*." And adds of *Diaparsus gilvipes*, Grav. (*lib. cit.* 1378), "utläckt ur *Hallomenus*."

148. *Hallomenus humeralis*, Panz.

A Braconid, *Diospilus filator*, Nees, is said by Giraud (Ann. Soc. Fr. 1877, p. 411) to have been bred by Perris from this beetle.

149. *Carida affinis*, Payk.

Gravenhorst (Ichn. Europ. iii. 777) writes of *Porizon boops*: ". . . alter Neeseo ab Esenbeck prorepit e larva

Hallomeni affinis, in *Boleto fomentario* habitante, mense Junii." This is quoted by Kirchner; and Ratzeburg (Ichn. d. Forst. ii, 86) says under *Porizon moderator* that Herr Wissmann has bred it from *Hallomenus affinis* in a fungus on beech at Münden, in Hanover.

150. *Melandrya caraboides*, Linn.

Laboulbène gives (Ann. Soc. Fr. 1877, p. 412) *Aspigonus diversicornis*,[255] Gir., as having been bred by Perris from this species; and Ratzeburg (Ichn. d. Forst. iii, 69) says Nördlinger found *Helcon claviventris* in the trunk of an ancient beech tree in company with it, adding *Mesostenus ater* as an alternative parasite; the latter, however, emerged from wood containing unspecified *Melandrya*, *Sphex* and *Dasytes* (*q. v. ante*).

151. *Mordellistena episternalis*, Muls.*

From this beetle, Giraud tells us (Ann. Soc. Fr. 1877, p. 426) that M. Perris bred the Chalcid, *Eurytoma histrionica*, Först.

152. *Metæcus paradoxus*, Linn.

It may be well to indicate that the Tryphonid, *Spheco-phaga vesparum*, Curt., though often found in the same nests of *Vespa vulgaris* as this anomalous beetle (cf. Morley, E. M. M. 1900, p. 123), is now considered to prey exclusively upon the larvæ of their common host, in spite of Hope's assumption that *S. vesparum* was parasitic upon *M. paradoxus* (Proc. Ent. Soc. 1838, iii, p. 177). It is not yet, however, known upon what the nondescript *Chalcid* and *Braconid*, which are also sometimes found in the same nests (cf. Kirby, Bridgwater Treatise, 1835, ii. 335), are parasitic.

153. *Rhynchophora.*

Westwood (Mod. Class. ii, 142) refers to an unspecified *Curculio*, which was discovered to be attacked by hymenopterous parasites by Rev. William Kirby, F.R.S.; and Ratzeburg (Ichn. d. Forst. ii, 213) says that *Encyrtus flaminius* has also been bred from some species of the same broad genus; further, Reissig (*lib. cit.* iii, 39) raised a ♂ of *Bracon scutellaris* from weevils in the leaves of sallow.

154. *Apoderus.*

At *lib. cit.* ii, 213, Ratzeburg tells us that an unspecified *Apoderus* has been found to be attacked by *Encyrtus flavomaculatus* and also (*l. c.* iii, 249) by *Ophioneurus simplex.*[426]

155. *Apoderus coryli*, Linn.

Ratzeburg says (*l. c.* ii, 94) that his single ♂ of *Pimpla longiventris* was found in an immature condition in a hazel leaf rolled by this beetle and thought consequently that it had undoubtedly been bred there. Reissig also bred (*l. c.* iii, 97) *Pimpla favipes*[51] and (iii, 217) *Elachestus leucobatus* from the same host.

156. *Attelabus curculionoides*, Linn.

Two specimens of *Ophioneurus simplex*[426] were bred by Herr Reissig (Ichn. d. Forst. iii, 197) out of the little larvæ of *Apoderus curculionoides* in rolled oak leaves at Darmstadt.

157. *Byctiscus betuleti*, Fab.

Rev. T. A. Marshall (Bracon. d'Europ. ii, 149) records *Calyptus tibialis*, Hal., which he thinks synonymous with *Brachistes politus*, Ratz., from this species, upon the latter's authority—Nördlinger found *B. politus* in a pear leaf rolled by this weevil early in June at Winnenden (Ichn. d. Forst. iii, 27);—he is however sceptical of the record from it of *Apanteles hoplites* (cf. *Melasoma tremulæ*, ante). Ratzeburg also mentions (*l. c.* ii, 214) *Bracon discoideus*, frequently bred from aspen leaves rolled by this beetle (p. 38); *Microgaster lævigatus*, one ♂ bred by Reissig (p. 50); *Pimpla flavipes*,[51] obtained in masses from *Curculio betuleti* in rolled aspen leaves in the middle of July (p. 91); and *Elachestus carinatus*, of which four specimens were bred from rolled aspen leaves—probably tenanted by this weevil—by Reissig (p. 173); as well as (iii, 249) *Ophioneurus simplex.*[426]

158. *Byctiscus populi*, Linn.

Herr Reissig bred *Bracon discoideus* from *Rhynchites populi* in rolled poplar leaves (Ichn. d. Forst. iii, 37).

159. *Deporaus betulæ*, Linn.

Ophioneurus signatus[427] is instanced by Reissig (*lib. cit.* iii, 249) as bred from leaves rolled by *Rhynchites betulæ.*

160. *Apion.*

Kirby and Spence (Introd. 7th Ed. 1859, 154) say they have received hymenopterous parasites from "The clover-weevil"—probably *Apion apricans*. Ratzeburg (Ichn. d. Forst iii, 249) instances *Pteromalus leguminum* and *Tridymus punctatus*,[311] bred from unspecified *Apiones*. Kirchner records (Cat. 179) *Cirrospilus nerio* "Aus *Apion* in *Spartium*-Hülsen erzogen." And Giraud tells us (Ann. Soc. Fr. 1877, pp. 428–30) that *Pteromalus fasciatus*, Först., and *P. regius*, Först., have been bred from uninstanced members of this rich genus.

161. *Apion apricans*, Herbst.

Perhaps Kirby and Spence's above record refers to *Callimone parallelinus*, Boh., which Reinhard once bred from this species.

162. *Apion bohemani*, Thoms.

Perris, according to Laboulbène (Ann. Soc. Fr. 1877, p. 428), bred *Pteromalus crichsoni*, Ratz., and perhaps also *P. albitarsus*, Walk., from *Apion ononidis*, in France.

163. *Apion craccæ*, Linn.

164. *Apion difficile*, Herbst.*

According to Marshall (Bracon. d'Europ. i, 144), Bach has raised *Bracon colpophorus*, Wesm., from the siliquæ of *Ervum hirsutum*, which were occupied by both these *Apiones*; the parasitism, however, appears open to doubt. Bach is also instanced (Ichn. d. Forst. iii, 234) as having bred *Pteromalus leguminum* in quantities from both *A. craccæ* and *A. difficile*.

165. *Apion loti*, Kirby.

166. *Apion rufirostre*, Fab.

Giraud tells us (Ann. Soc. Fr. 1877, p. 412) that *Sigalphus floricola*, Wesm., has been bred from both *Apion atritarse* and *A. loti* by Edouard Perris.

167. *Apion trifolii*, Linn.

This species is said by Laboulbène (*loc. cit.* p. 429) to have been parasitically attacked, according to Perris, by *Pteromalus leguminum*, Ratz.

168. *Apion urticarium*, Herbst.

Perris has also raised *Pteromalus muscarum*, Htg., according to Laboulbène (*l. c.*), from *Apion vernale*.

169. *Apion violaceum*, Kirby.

Entedon curculionum, Giraud, is said by its author (Ann. Soc. Fr. 1877, p. 432), upon the authority of Perris, to prey, among other weevils, upon this species.

170. *Apion brevirostre*, Herbst.*

M. Edouard Perris, who has done such good work in this genus, is also said (*loc. cit.*) to have bred *Eulophus atrocæruleus*, Nees, and *Tetrastichus rosarum*, Först., from this *Apion* in France.

171. *Apion sulcifrons*, Herbst.*

Giraud records (Ann. Soc. Fr. 1877, pp. 425 et 432) his *Eurytoma apionum* and *Entedon nitens* from *Apion sulcifrons*, in the latter case upon *Artemisia campestris*, Linn.

172. *Apion Perrisi*, Wenck.*

From a species thus named, Laboulbène (*loc. cit.* p. 414) says M. Perris bred *Bracon rufator*, Gir., in France.

173. *Apion consimile*, ? MS.*

Laboulbène also records (*l. c.* p. 432) *Entedon longiventris*, Ratz., bred from *Apion consimile* by Dr. Giraud.

174. *Otiorhynchus ligneus*, Oliv.

Bracon Otiorhynchi ♀ and *B. Barynoti* ♂, described by Boudier, are the sexes of *Ganychorus tuberculatus*,[240] Wesm. (Nouv. Mém. Ac. Brux. 1835). A single larva of the ♀ was bred from *Otiorhynchus ligneus* and a single larva of the ♂ from *Barynotus moerens*, after the perfect beetles had been pierced with pins for preservation. These larvæ, which emerged from the abdomens of their respective hosts, spun their cocoons on to the pins, beneath the beetles' bodies; they were bred at Montmorency (cf. Boudier, Ann. Soc. Fr. 1834, pp. 327–336, et Westwood, Mod. Class. ii, 143). What do we not lose by too thoroughly killing our cabinet specimens now-a-days!

175. *Otiorhynchus maurus*, Gyll.

Oresbius castaneus was conjectured by Marshall (E.M.M. iii, p. 194) to possibly be parasitic upon this weevil (cf. Morley, Ichn. Brit. ii. 109).

176. *Trachyphlœus scabriculus*, Linn.

An instance—our only one—of oviposition in a perfect beetle was witnessed by M. Boudier, who says (Ann. Soc. Fr. 1834, p. 332) that he saw a small, unspecified Ichneumon-fly "cramponné sur le dos de *Trachyphlœus scabriculus*. Il avait introduit sa tarrière entre les elytres et l'abdomen par l'anus" (Westwood, Mod. Class. ii, 144).

177. *Phyllobius urticæ*, DeG.

Under his *Dolops aculeator*, Marshall (Bracon. d'Europ. ii, 269) says that, in default of direct proof, he suspects it to be parasitic upon this common weevil. The only herbage where he took the Braconid, near Teignmouth, was a single clump of *Urtica dioica*, whereon was *Phyllobius alneti* in profusion.

178. *Barynotus elevatus*, Marsh.

[Cf. *Otiorhynchus ligneus*, above.]

179. *Hypera*.

In 1902, Rev. T. A. Marshall was so good as to send me, from Corsica, a specimen of some Pimplinæ (possibly *Pimpla abdominalis*, Grav.), which he had bred from an unspecified *Phytonomus* [C. M.]. Cf. also *Prasocuris phellandrii*, ante.

180. *Hypera rumicis*, Linn.

From a larva of *Phytonomus rumicis*, Kawall bred (Stett. Ent. Zeit. 1855, p. 230) at end of July, both sexes of *Phygadenon rufulus*, Gmel.

181. *Hypera polygoni*, Linn.

Herr Dahlbom bred *Campoplex subcinctus*,[102] Grav., from larvæ of *Phytonomus polygoni*, which were feeding upon *Silene* in the Botanical Gardens at Lund, 8th August, 1837 (Ichn. d. Forst. ii, 82.) Jacobi bred *Mesochorus nigripes*, Ratz., out of the same beetle in Prussia; he found the

yellow, translucent cocoons adhering to leaves; towards the end of July the ichneumon emerged and left in the coleopterous cocoon a brown, thick-walled cocoon of its own; the beetle itself emerged from its adjacent cocoons (*lib. cit.* iii, 118—referred to by Kirchner, Cat. 97).

182. *Hypera plantaginis*, DeG.

Curtis mentions (B. E. pl. dxxxvi) that a species of the Cryptid genus *Pezomachus* has been bred from *Curculio plantaginis*.

183. *Rhinocyllus latirostris*, Latr.

Goureau gives an interesting account of *Bracon urinator*, Fab., which is parasitic upon this species in *Carduus nutans*. He says it is full-fed and has demolished its host-larva by about the middle of August, when it spins a cocoon which occupies that of the beetle. Therein it passes the winter and does not assume the pupal condition till the end of the following March; the imago emerges at the beginning of April, but is commonest during June (cf. Bracon. d'Europ. i, 156–7).

184. *Lixus algirus*, Linn.

In the ancient and badly neglected collection of British Ichneumonidæ in the British Museum is an unnamed ♀ *Pimpla* (*Epirus*), a stout insect, as large as *P. graminellæ*, Schr., black with totally flavous legs and terebra half length of body—labelled "Ichneumon of *Lixus angustatus*, Fairlight, Aug. 31st; F. Smith." In August 1902 Mr. Donisthorpe took at Rye, in the same neighbourhood of Sussex, a ♀ of the ubiquitous *Ophion luteus*, Linn., which he says "settled on a larva of *Lixus algirus*."

185. *Lixus iridis*, Oliv.*

Prof. Dr. Otto Schmiedeknecht gives (Opusc. Ichn. 544) *Hoplocryptus insectator*, Tschek, as parasitic upon *L. turbatus*, Schh.

186. *Larinus carlinæ*, Oliv.

Pteromalus elevatus, Walk., is said by Dr. Giraud (Ann. Soc. Fr. 1877, p. 428) to have been bred from this species by Perris in France.

187. *Cuculio abietis*, Linn.

Ratzeburg gives (Ichn. d. Forst, ii. 213) *Ephialtes tuberculatus, Bracon hylobii* and, doubtfully, *Pteromalus multicolor*,[308] as parasitic upon *Hylobius pini*. Of *B. hylobii* Nördlinger bred in May 40 ♀♀ and 4 ♂♂ from this species, each of whose larvæ supports about ten parasites; the cocoons of the latter are firm, oat-shaped and papyraceous, woven among their hosts' frass and dead bodies, and often constructed at the end of the beetles' borings, beneath fir bark (*l. c.* ii, 38). A single *E. tuberculatus* was bred at the end of July at Hohenheim from a Weymouth pine in which this weevil lived; it had apparently emerged from an elongate cocoon, presumably of its own construction (*l. c.* ii, 100). Taschenberg says (Zeits. Ges. Nat. 1863, p. 267) that it is also preyed upon by *Pimpla terebrans*, which is recorded from *Curculio pini* (Ichn. d. Forst. ii, 38).

188. *Pissodes notatus*, Fab.

Much attention was paid to the parasitism of this species by Ratzeburg, who records (Ichn. d. Forst. i, 23, ii, 214 et iii, 249) the attacks of twenty-nine different Hymenoptera upon it, including *Eupelmus azureus*,[278] *Eurytoma* sp., *Pteromalus pellucens* and *P.* ? *æmulus*. *Hemiteles melanarius* and *H. modestus*[18] (iii, 153–4) were both bred by Reissig from young fir trees containing, principally, *Curculio notatus* and *Hylesinus piniperda*; *Neurateles papyraceus* (ii, 86) were bred, probably from this weevil, from firs near Saarbrücken; *Ephialtes carbonarius* (ii, 99) emerged at Neunkirchen in Rhenish Prussia, probably from this beetle; *Pimpla lincaris* (ii, 93) was certainly bred from *Curculio notatus*, by both Reissig and Ratzeburg from both young firs and fir-cones, together with *P. laticeps* (ii, 94 et iii, 100), in the same locality. Quantities of both sexes of *Bracon disparator*[175] (i, 46) were bred from fir billets infested by this weevil; two ♀♀ *B. incompletus*[155] (i, 44) were bred from fir, probably from this beetle, in Germany; *B. labrator* (i, 47 et ii, 40) was bred at Borutin in Upper Silesia from fir logs infested with *C. notatus*; both sexes of *B. palpebrator* (i, 47 et ii, 39) were bred in quantities from fir wood full of these larvæ at Trier; ♂♂ of *B. sordidator* (i. 48) were bred, with the last-named species, in Upper Silesia from fir logs, probably also from this beetle. *Brachistes atricornis*[234] (ii, 28) is one of its commonest parasites, in

firs in the Neunkirchen district; from fir cones containing larvæ of *C. notatus*, *B. firmus* [235] and *B. robustus* [231] (i, 54 et ii, 27) were bred; at Borutin one specimen of *Microdus abcissus* [207] (i, 57) was bred from fir wood, filled with a brood of these larvæ; a few specimens of *Spathius brevicaudis* (ii, 43) were bred from fir containing this weevil at Neunkirchen and from the Mark. *Eurytoma ischioxanthus* is referred to (iii, 221), though the identification appears not quite established, as bred by Nördlinger with *Pimpla laticeps* out of *C. notatus* in fir cones; a single specimen of *Hadrocerus unispinosa* [430] (iii, 183) was bred, with a mass of *B. palpebrator*, *Pteromalus guttatus* and a few Diptera, from a great number of young dead fir trees from the Ostree coast, which had been killed by this weevil, though the parasitism is doubtful. *Pteromalus guttatus* is said (i, 188 et ii, 193) to be one of the commonest parasites of this beetle; *P. clavatus* (ii, 202) emerged from Trier firs, infested by *C. notatus*, from which also *P. Dahlbomi* (i, 202 et ii, 201) was raised in fir billets from several places in the Mark; several ♀♀ *P. lunula* (ii, 193) were bred from fir plants full of these larvæ at Neunkirchen; *P. suspensus* (*l. c.*) was bred from this weevil at Trier and by Nördlinger from *Pinus pinaster* in which *C. notatus* and *Hylesinus piniperda* had bored; *P. virescens* [375] (ii, 204) was also raised from the same host at Trier. Brischke gives (Schr. Nat. Ges. Danz. 1880, p. 113) *Pimpla brevicornis*, Grav, var. 3, Holmgr., as well as *Pteromalus guttatus*, "Aus *Pissodes notatus* erzogen"; and Giraud adds (Ann. Soc. Fr. 1877, p. 414) *Bracon initiator*, [162] Fab. and *B. palpebrator*, Ratz., as having been bred from it in France.

189. *Pissodes pini*, Linn.

I have had in my collection for some years (says Ratz., Ichn. d. Forst. i. 193) a genuine *Pteromalus pini* which, from the attached number, appears to have been bred from *Pissodes pini*.

190. *Pissodes hercyniæ*, Herbst.*

Curiously distinct parasites from those of *P. notatus* were recorded from *Curculio hercyniæ* by Ratzeburg (*l. c.* ii, 214) who instances *Pimpla terebrans*, bred from it by Wissmann (ii, 89); *Xorides crassipes* and *X. hercyniunus*, which two doubtfully distinct species were bred by Hartig from spruce

bark in which larvæ of this weevil were boring (ii, 106); *Brachistes atricornis*,[234] bred in spruce bark under which were these larvæ (ii, 28); and *Sigalphus curculionum*,[229] which is said by Hartig to be its chief parasite (ii, 74).

191. *Pissodes piniphilus*, Herbst.*

From this weevil, which is very closely allied to *P. notatus*, Ratzeburg (*l. c.* iii, 249) bred only *Bracon palpebrator*.

192. *Orchestes*.

Nördlinger bred *Entedon confinis* at Grand Jouan, in France (*l. c.* ii, 166), and Ratzeburg records in Germany *Eulophus xanthops*[420] (i, 23), which both preyed upon unspecified individuals of this genus.

193. *Orchestes alni*, Linn.

Tetrastichus orchestis, Först., is indicated by Laboulbène (Ann. Soc. Fr. 1877, p. 434) as having been bred by Dr. Giraud from this species.

194. *Orchestes leucaspis* = ? *scutellaris*, Germ.

Nördlinger bred from *O. leucaspis*, Mus. Ber. (= *semirufus*, Koll.), in birch leaves *Sigalphus fulvipes*[186] (Ichn. d. Forst. ii, 26), *Eulophus dendricornis* (ii, 155) and one ♂ of *Pteromalus Jouanensis* (ii, 199); and Ratzeburg says he obtained only one *Pteromalus orchestis* among many thousands of other parasites bred in this genus (ii, 205), adding that the same species emerged from *Orchestes leucaspis* at Grand Jouan in birch leaves.

195. *Orchestes fagi*, Linn.

Two specimens, and later (*l. c.* iii, 28) a ♂, of *Brachistes minutus*[228] were bred from *Curculio fagi*, together with one ♂ of *Pteromalus cruciatus* (ii, 205), on 10th June by Herr Reissig (ii, 28); both sexes of *Brachistes fagi*,[186] bred by Brischke from this host early in June (iii, 28), as well as (iii, 249) *Exotheccus debilis*, bred by Nördlinger and Reissig (iii, 42); *Sigalphus caudatus*, *Entedon lutcipes*; *E. flavomaculatus*, bred by Reissig (iii, 208); *E. lineatus*,[389] one specimen bred by Nördlinger at Hohenheim (iii, 209); *E. orchestis*, bred at the same place by Nördlinger (iii, 206), and *E. xanthostoma*; *Eulophus lepidus*,[351] bred with *Entedon xanthops* by Nördlinger at Hohenheim (i, 170 et iii, 242); *E. diachymatis*[337] and *E. pilicornis*—are all recorded

by Ratzeburg from this beetle. Marshall adds (Bracon. d'Europ. i, 187) *Collastes braconius* to the list of its enemies; and Brischke gives *Sigalphus pallidipes*, Nees, "aus Larven von *Orchestes fagi* erzogen."

196. *Orchestes ilicis*, Fab.

There are no exact records of hymenopterous parasitism upon this beetle, though Nördlinger has thrice bred Chalcids from *O. ilicis* in company with *O. quercus*: thus we find both sexes of *Eulophus fumatus* (Ichn. d. Forst. ii, 156) bred from oak leaves in which these two species of weevils were feeding; *Entedon medianus* (*l. c.* 169) bred from both or either; and *Pteromalus Jouanensis* (*l. c.* 199) bred in the same way at Grand Jouan.

197. *Orchestes salicis*, Linn.

Upon this species prey *Entedon orchestis* and *E. punctatus*, which were both bred, together with a *Pteromalus*, by Reissig on 1st October (*lib. cit.* ii, 160 et 165); *E. unicostatus*, of which one specimen was bred from this host by Bouché (ii, 163); and Ratzeburg further records *E. medianus* as preying upon it in France.

198. *Orchestes scutellaris*, Gyll.

Giraud thrice bred Chalcids from this species (Ann. Soc. Fr. 1877, pp. 432–4), which were *Pleurotropis orchestis*, Gir., *Tetrastichus frontalis*, Nees, and *T. orchestis*, Först.

199. *Orchestes quercus*, Linn.

The parasites bred in Germany from this common weevil (Ichn. d. Forst. i, 23, revised and extended ii, 213) are very numerous, comprising *Ischius striolatus*, *Entedon confinis* and *E.* ? *lutcipes*; Ratzeburg bred one ♂ of *Pimpla alternans* (ii, 92), nearly certainly from this host, among other parasites; *Polysphincta latistriata* (i, 120) bred from this weevil in the epidermal bladders on the white-spotted oak leaves. *Microgaster brevicentris*,[202] (ii, 51) bred on 20th July from *Curculio quercus*, after most of its other parasites had emerged; both sexes of *Sigalphus caudatus* (ii, 25) from oak leaves in which this weevil lived and from the same host by Nördlinger on 12th June; both sexes also of *Spathius clavatus*[147] (ii, 42) were obtained on 26th June from oak leaves infested by this beetle. Both sexes of *Elachestus*

obscuripes (i, 165 et iii, 173) bred sparingly, with *E. sesquifasciatus*[417] (i, 164), from oak leaves mined by *O. quercus*; *Entedon cyclogaster* (i, 167), lying free beside this beetle's larval skin; one ♂ of *E. flavomaculatus* (i, 164), bred on 10th July from oak leaves mined by this host; *E. lunatus* (ii, 166), bred in quantities from *O. quercus*, with *E. orchestis* (i, 165 et ii, 160), at Neustadt; *E. medianus* (ii, 169) bred in France by Nördlinger from mixed *O. quercus* and *O. ilicis*; a single ♀ of *E. amethystinus* (ii, 170) was also bred, among a large number of other species, from *O. quercus*. Nördlinger bred one *Eulophus dendricornis* (i, 161) early in June from mining larvæ of *O. quercus* in alder leaves, and both sexes of *E. fumatus* (ii, 156) from oak leaves containing both this species and *O. ilicis*; *E. pilicornis* (i, 160) was several times bred from the subcutaneous larvæ of *O. quercus*, sometimes alone, at others with *Pteromalus orchestis* and a ♀ *Eupelmus viduus*; *Eulophus pectinicornis* (i, 161) preys on the same host. *Pteromalus Jouanensis* (ii, 199) was bred by Nördlinger from mixed *Orchestes quercus* and *O. ilicis* at Grand Jouan, in France; and Ratzeburg bred *Elachestus obscurus*[391] (ii, 173) infrequently from the former; lastly a single specimen of the Proctotrypid, *Telcas minutus* (ii, 143), was found dead among hundreds of this beetle's parasites. According to Marshall (Bracon. d'Europ. ii, 141), C. Rondani also bred his *Eubadizon orchestis* from this weevil in Italy.

200. *Orchestes viminalis*, Ratz.*

It appears that Ratzeburg considered this species synonymous with, or a variety of, the last, under which (Ichn. d. Forst. i, 203 et 205) he says of *Pteromalus diachymatis*: "I have the five ♀ ♀ out of larvæ of *Orchestes viminalis* in oak leaves, together with my *P. orchestis* and *Eulophus pilicornis*, on 13th July." Kirchner, however, perpetuates the name (Cat. 169): "*Pteromalus diachymatis*, Ratz., Preuss. Aus. *Orchestes viminalis*." Cf. also Forstinsecten, i, 155.

201. *Miarus campanulæ*, Linn.

Brischke (Schr. Nat. Ges. Danz.) gives *Bracon variator*, *B. terebella*, *Pezomachus fasciatus* and *Pimpla brevicornis* as parasitic upon this weevil. The last-named parasite was

also bred from it by Giraud (Laboulbène, Ann. Soc. Fr. 1877, p. 408), where *Bracon variator*, Nees, *Systasis encyrtoides*, Walk., and *Pteromalus auronitens*, Först., are also indicated as attacking *Gymnetron campanulæ*.

202. *Gymnetron antirrhini*, Payk.

Sigalphus pallidipes, Nees, is said by Marshall (Bracon. d'Europ. i, 315) to be a common parasite of this species; he adds (*lib. cit.* 320) that *S. obscurellus* also preys upon *Gymnetron noctis*, Herbst.: "des galles produites sur le lin sauvage."

203. *Gymnetron beccabungæ*, Linn.

From this weevil, Brischke (Schr. Nat. Ges. Danz.) has bred an undetermined species of *Bracon*, together with *Pteromalus curculionoides*.

204. *Gymnetron collinus*, Gyll.

Bignell writes of *Sigalphus obscurellus*, Nees (Trans. Devon. Assoc. 1901, p. 667): "Bred from *Gymnetron collinus*, a beetle feeding on the unripe seeds of the toad-flax, *Linaria vulgaris*, September 19th, 1880."

205. *Gymnetron villosulus*, Gyll.

In his Naturgeschichte der Insecten (1834), Bouché tells us that his *Pteromalus curculionoides* feeds upon the larvæ of *Gymnætron villosulus* (cf. Westwood, Mod. Class. ii, 159).

206. *Gymnetron teter*, Fab.*

Kirchner (Cat. 105) gives "*Pimpla gymnetri*, Ratz., Preussen, Gez. aus *Curculio teter*"; as recorded by the latter (Ichn. d. Forst. ii, 96 et iii, 103), bred from the knot-like swellings caused by the larvæ of this beetle on the previous year's, already woody, stems of *Verbascum nigrum*.

207. *Gymnetron asellus*, Grav.*

At Ann. Soc. Fr. 1877, p. 413 *et seqq.*, Laboulbène records *Bracon gymnetri*, Gir., *B.* ? *dichromus*, Wesm., and *Entedon curculionum*, Gir., from this beetle.

208. *Gymnetron cylindrirostris*, Schh.*

From this species (probably synonymous with the last) also are recorded (*loc. cit.*) *Bracon gymnetri* and *Entedon curculionum*.

209. *Mecinus collaris*, Germ.

Pimpla palliata, Gir., and *Pteromalus revelatus*, Först., are recorded by Laboulbène (*l. c.*) from this weevil.

210. *Anthonomus pomorum*, Linn.

Herr Reissig bred *Pimpla pomorum* from *Curculio pomorum* in a pear blossom (Ichn. d. Forst. ii, 96) and later (iii, 102) both sexes from the same pabulum on apple; Nördlinger also bred it from this host, as well as one ♂ of *Campoplex latus* (ii, 84), at Hohenheim in June. *Microgaster impurus* [201] (ii, 52) was frequently bred by Reissig from apple blossom infested by this weevil; and Ratzeburg refers (ii, 213) to *M. albipennis* [200] as doubtfully preying upon the same host. Of *Chrysolampus æneus* he says (ii, 185): "I bred one out of *Curculio pomorum*, yet it is possible that accidentally imprisoned *Aphidæ* may have yielded this guest." He further bred a single ♀ *Encyrtus flavomaculatus* (ii, 146) from apple blossom containing this beetle—possibly, however, some *Aphidæ* may have been present here also and yielded this parasite. A somewhat doubtful ♂ of *Pteromalus Saxesenii* (iii, 242) was also raised from apple blossom, though no coleopterous host is indicated. Brischke bred from the same host (Schr. Nat. Ges. Danz. 1880, pp. 111, 113) *Pimpla examinator*, Fab., *P. sagax*, Htg., as well as *Microgaster lacteus*,[199] Nees.

211. *Brachonyx pineti*, Payk.

Four or five kinds of Chalcids are recorded from *Braconyx indigena* by Ratzeburg (Ichn. d. Forst. iii, 249), a single, damaged specimen of *Hadroceras vitripennis* [431] (iii, 183) was bred from this weevil—or, just possibly, from the midges which were bred with it; *Entedon vaginulæ* (iii, 213) was freely bred from it by Herr Reissig, and is said to be its commonest parasite; a single *Eupelmus Geeri* (iii, 198) was also bred from this beetle, called the "Fir-leaf Cutter" in Germany; and several ♀ ♀ *Pteromalus vaginulæ* were raised upon two occasions, in both cases with—? its ♂—*P. nanus*, by Reissig at the end of July.

212. *Nanophyes lythri*, Fab.

Laboulbène records (Ann. Soc. Fr. 1877, p. 420) that Perris has bred *Eupelmus Degeeri*, Dalm., and (p. 430) that Dr. Giraud also raised *Pteromalus vaginulæ*, Ratz., from this beetle.

213. *Cionus scrophulariæ*, Linn.

Bignell says (Entom. 1885, p. 152) that he bred *Hemimachus instabilis*,[22] Först., from a pupa of this beetle, August 23rd, 1882. Thomson records (Opusc. Ent. x, 980) *Hemiteles areator*, "Kläckt ur *Cionus scrophulariæ*." And Bridgman tells us (Trans. Norf. Soc. 1895, p. 114): "Mr. Thouless gave me a female *Pezomachus corruptor*, Först., which he had bred from the larva of *Cionus scrophulariæ*, a beetle which he took at Horsford, August 1894. This is interesting, as it is seldom that ichneumons are bred from beetles ; it may be due, in a measure, that beetles are not bred to the same extent that butterflies and moths are." This example of *P. corruptor*, which I have examined and found correct, is now in the Norwich Castle Museum [C..M.].

214. *Cionus tuberculosis*, Scop.

Brischke records his ♀ *Pezomachus thoracicus* (Schr. Nat. Ges. Danz. 1881, p. 351): "Aus *Cionus verbasci* erzogen"; and indicates *Entedon discolor* as preying upon the same species.

215. *Sterconychus fraxini*, DeG.*

This weevil is said to be attacked by the Braconid, *Blacus ruficornis*, on the strength of a single example which was bred by Dahlbom, who writes *in lit.* (Ichn. d. Forst. ii, 61): "Exclusus e Pupa Rhychæni (Cioni) fraxini, Gyll., 7th Septb., Lund." Professor Kawall also bred (Stett. Ent. Zeit. 1855, p. 231) two species of *Pteromalus*, and a specimen of *Pezomachus agilis*, Fab., var. 4 b, Grav., from *Cionus fraxini*.

216. *Cryptorrhynchus lapathi*, Linn.

Kirchner records (Cat. 108) *Ephialtes tuberculatus*, Fourc., as parasitic upon this species; and Ratzeburg instances (Ichn. d. Forst, ii, 213) *Pimpla cicatricosa*[50] and

P. Reissigii[39] (ii, 89) as both bred by Herr Reissig from alder in which this beetle lived, the cocoon he says is seven lines in length, clothed with scraps of wood without but perfectly smooth within; both sexes of *Campoplex gracilis*[104] (ii, 81) were also bred from this host by the same observer on April 13th and 14th. Further Reissig bred several specimens of both sexes of *Bracon immutator* (ii, 41) from the pupal nests of this weevil, adding that the thick brown cocoons were disposed without order but all in close proximity; he also bred several *Rogas marginator*[251] (ii, 65) from *C. lapathi* in alder shoots on May 4th, as well as a single Braconid resembling *R. limbata*, but with the neuration of *Brachistes*, which escaped; his last parasite of this species was the Proctotrypid, *Diapria melanocorypha* (ii, 144). A single ♀ of *Ichneumon hassicus*[1] is recorded (*lib. cit.* ii, 136) from the same beetle on April 7th; cf. Morley, Ichn. Brit. i, 292. We captured three ♀♀ *Ephialtes carbonarius*, Christ., flying in the vicinity of this beetle's borings in sallow trees at Tuddenham Fen, in Suffolk, on June 12th, 1900.

217. *Gasterocercus depressirostris*, Fab.*

This beetle—not *Rhinocyllus depressirostris*, Schh., as erroneously given by Marshall (Bracon. d'Europ. i, 197)—was discovered by Radzay in a small live portion of an otherwise dead eighty-year-old oak, the bark of which was considerably impaired by its borings. With it was *Spathius Radzayanus* (Ichn. d. Forst. ii, 44, footnote) which was parasitic, very probably ektoparasitic, upon it, two or three apparently attacking each of the somewhat gregarious larvæ. The parasitic cocoons are elongate, pale rose-red, two and a half lines in length, and two to six of them lie close together in the excreta beneath bark. [Cf. also *Agrilus biguttatus*, ante.]

218. *Mononychus pseudacori*, Fab.

Fred Smith tells us (Ent. Ann. 1864, p. 114) that Mr. Butler has bred a parasite, "apparently belonging to the genus *Sigalphus*," from this weevil in the capsules of *Iris fœtidissima* at Ventnor.

219. *Cœliodes quercus*, Fab.

Marshall says (Bracon. d'Europ. i, 492) that Ratzeburg bred his *Apanteles breviventris* from *Cœloides quercus* in

Germany. This may be correct, since in every other case the latter writes "*Orchestes*" *quercus* (*q. v., ante*), but in that of *Microgaster breviventris* (Ichn. d. Forst. ii, 52) it becomes "*Curculio*" *quercus*.

220. *Ceuthorrhynchus assimilis*, Payk.

Reinhard bred *Diospilus oleraceus*, Hal., from the galls of this weevil on *Sinapis arvensis* (as recorded by Kirchner, p. 132, and Marshall ii, 259).

221. *Ceuthorrhynchus cyanipennis*, Germ.

Thersilochus moderator, Grav., is said by Brischke (Schr. Nat. Ges. Danz. 1880, p. 193) to have "Aus Larven von *Ceuthorrhynchus cyanipennis* erzogen." Possibly hyperparasitic—cf. *Orchesia micans*, ante—through the usual enemies of this genus, the species of *Diospilus*.

222. *Ceuthorrhynchus pleurostigma*, Marsh.

In Ent. Ann. 1874, p. 126, Marshall records *Diospilus nigricornis*, Wesm., as bred from *Ceuthorrhynchus sulcicollis*, Gyll.; this is not referred to in his Bracon. d'Europ. (ii, 265), but, at *lib. cit.* i, 320, *Sigalphus obscurellus*, Nees, is given as a parasite of the same beetle "sur le chou." *Diospilus oleraceus* was bred by Dr. Giraud (Zool.-bot. Ver. V. Sitzb. 128) from the galls of this weevil. Mr. Horace Donisthorpe bought a turnip in a London shop because it contained the characteristic cysts of this beetle, from which in February 1900 emerged a ♀ *Sigalphus floricola*, Wesm.

223. *Ceuthorrhynchus punctiger*, Gyll.

From this species Giraud tells us (Ann. Soc. Fr. 1877, p. 403) that both *Bracon maculiger*, Wesm., and *Porizon moderator*,[106] Grav., have been bred. As in the case of *C. cyanipennis*, the latter was very probably hyperparasitic.

224. *Ceuthorrhynchus rapæ*, Gyll.

Diospilus oleraceus, Hal., was bred by Laboulbène from the galls produced by this weevil on the roots of *Lepidium draba* (Ann. Soc. Fr. 1877, p. 411).

225. *Baris laticollis*, Marsh.

226. *Baris chlorizans*, Germ.

227. *Baris cuprirostris*, Fab.*

Rev. T. A. Marshall was somewhat sceptical (in MS.) of the accuracy of M. Edouard Perris' observations regarding the parasitism of *Pentaplcura fuliginosa*, Hal., upon the above three species of *Baridius*.

228. *Balaninus nucum*, Linn.

The parasitism of *Pimpla nucum* upon the Nut Weevil appears in need of considerable confirmation. Towards the end of May the former swarmed, says Nördlinger (Ichn. d. Forst. ii, 90), at Hohenheim, on the window of a room in which beech-nuts were stored, and these latter he found to be bored by *Curculio nucum*. Herr Zeller obtained the same Pimplid on April 18th from acorns, "therefore probably from *Balaninus*."

229. *Balaninus pyrrhoceras*, Marsh.

Laboulbène tells us (Ann. Soc. Fr. 1877, p. 413) that Giraud has bred *Bracon discoideus*, Wesm., from this species.

230. *Balaninus villosus*, Fab.

Porizon nutritor, Grav., is said to have been bred from this weevil in France (*loc. cit.* p. 403).

231. *Magdalis*.

Unspecified individuals of this genus have yielded, according to Ratzeburg (Ichn. d. Forst. ii, 213) *Elachestus leucogramma*, *Pteromalus magdalis* and *P. virescens*,[375] which last is the *P. violaceus* of i, 23; and later (*l. c.* iii, 249) he adds *Cryptus echthroides* and *Pteromalus tessellatus*, with doubtfully *Pimpla linearis* and *Eusandulon trideus*. Cf. also *Tetrops præusta*, ante [THAMNOPHILUS, Schönh. = MAGDALIS, Germ.].

232. *Magdalis carbonaria*, Linn.

From *Magdalinus memnonius*, Giraud says (Ann. Soc. Fr. 1877, p. 429) that *Pteromalus magdalis*, Ratz., has been bred by Perris.

233. *Magdalis phlegmatica*, Herbst.

Reissig bred a single ♂ *Hemiteles melanarius* from *Curculio* (*Thamnophilus*) *phlegmaticus* on April 17th (Ichn.

d. Forst. ii, 128); and Ratzeburg obtained a couple of *Alysia rubriceps*,[264] ♀♀ (*l. c.* i, 56) from fir logs infested by the same beetle.

234. *Magdalis violacea*, Linn.

Several specimens of *Chelonus atriceps* were bred by Ratzeburg (Ichn. d. Forst. i. 43) from spruce infested with *Magdalis violacea* in the Frankenwald; *Glypta concolor* (i, 121) was also bred with this beetle, out of fir billets, as were several *Eurytoma abieticola* (i, 174) from fir logs; several ♀♀ *Pteromalus violaceus* (i, 208) emerged from fir billets from the Hartz, in which this beetle had bored; and several *Spathius brevicaudis* (i, 49) from fir wood infested with *Curculio violaceus*. *Brachistes rugosus*[232] (ii, 28 et iii, 29) was bred by both Nördlinger from young dry fir, and Ratzeburg from blocks of wood, in which *C. violacea* was living; many ♂♂ of *Pteromalus virescens*[375] (ii, 204) were also bred by the former, and *Opius rubriceps*[264] (iii 66) by the latter, from this weevil.

235. *Rhopalomesites tardyi*, Curt.

Under *Odontomerus dentipes*, Gmel., in his private copy of the 1872 Catalogue of British Hymenoptera, Marshall has entered a MS. note: "♂ taken by Bignell, Aug. 6, entering burrows of *Mesites tardii*."

236. *Eremotes strangulatus*, Perr.*

Exothecus rhyncoli, Gir., is said by Dr. Laboulbène (Ann. Soc. Fr. 1877, p. 414) to have been bred from this species by Perris.

237. *Scolytus*.

Brischke records *Pachychirus quadrum*[313] from *Eccoptogaster* sp., and Giraud, *Exothecus lanceolator*,[145] Nees, from *Scolytus* sp.; *Brachistes longicaudis*[230] was bred from an unspecified individual by Ratzeburg (Ichn. d. Forst. i, 23), and Kirchner (Cat. 118, probably quoting *lib. cit.* iii, 27) gives *Sigalphus flavipalpis*,[186] Wesm., "Hohenheim. Gez. aus *Eccoptogaster*-Arten."

238. *Scolytus destructor*, Oliv.

From *Eccoptogaster scolytus* some interesting parasites have been recorded by Ratzeburg, who received several ♂♂

of *Ichneumon nanus*[3] (Ichn. d. Forst. ii, 133) out of elms infested by this borer, from Radzay, who also bred a single ♀ *Hemiteles modestus*[18] (ii, 129) from the same host, together with a quantity of both sexes of *Bracon initiatellus* (ii, 39). *B. Middendorffii*,[177] *B. minutissimus*[158] and *B. protuberans*[176] are also given (ii, 214) as preying upon this species. Both Radzay and Nördlinger bred *B. curtisii*,[176] ♂♀ (ii, 32) sparingly from this weevil in elm; and the former further raised from it a single ♀ *Spathius exannulatus*[147] (ii, 42). *Elachestus leucogramma* (ii, 174) was bred by Nördlinger at Grand Jouan in June from a mixed lot of *E. scolytus*, *E. intricatus* and *E. multistriatus*, as well as by Radzay in Germany from *E. scolytus* only together with a single *Pteromalus capitatus* (ii, 196); Nördlinger also bred at the same time and place *Pteromalus bimaculatus* and *P. brunnicans* (ii, 188) from this beetle. An unusually large and untypical ♀ of *P. lunula* (ii, 193) was raised from it by Wissmann; and Radzay added *P. vallecula* (ii, 206) and *P. lanceolatus* (ii, 207) to its list of parasites from Falkenberg in Silesia. *Scolytus destructor* is further attacked (cf. Ann. Soc. Fr. 1877, p. 414) by *Cœloides scolyticida*, Wesm., and—"Scolytus de l'Orme"—by *Cerocephala cornigera*, Westw. "And Mr. Spence has also observed the larvæ and pupæ to be infested to a great extent with minute worm-like Oxyurides" (Westwood, Mod. Class. i, 255).[1]

[1] "It may be here mentioned, though somewhat out of place, for the purpose of drawing the attention of Entomologists to a new tribe of insect-parasites of which no account appears to have been given in books, that in examining closely the pupæ of *Scolytus destructor* at Brussels, I found them lined in different parts of their external surface, but especially on the thorax and about the cases of the elytra, with numerous transparent eel-shaped vermicles. . . . The vermicles, under M. Wesmael's powerful compound microscope, with which he was so good as to assist me in examining them, exhibit not the slightest trace either of mouth or other external organ, nor of intestines, nor of internal vessels of any kind, which, if any such existed, might be easily seen through their transparent skin and body. This absence of all external and internal organs (the inside of the body seeming filled with *granular molecules*), added to their shape, which is filiform and very slender, sharply attenuated at each extremity, and their hyaline colour, with very indistinct traces under a high magnifying power of about twenty segments, each as long as broad, are all the characters they afford. . . . From their connection with an animal, they might be regarded as referable to the Oxyuri, were it not that neither my own nor M. Wesmael's close examination could ever discover any trace of their existence in the interior of either

On an old elm log full of *S. destructor*, at Wherstead in Suffolk, several ♀♀ of *Cheiropachus quadrum* were found on May 3rd, 1904 [C. M.].

239. *Scolytus intricatus*, Ratz.

Its author indicates as preying upon this borer (Ichn. d. Forst. i, 23) *Elachestus leucogramma* (ii, 174), bred by Nördlinger at Grand Jouan in June with *Eulophus albipes*[380]; *Eurytoma eccoptogastri*, *Pachyceros eccoptogastri*[311A] (i, 280) of which a single ♀ was bred in July, *Pteromalus binævius*[327] and *Cleonymus pulchellus*; adding (ii, 214) *Bracon protuberans*,[176] bred from this host (iii, 32) in oaks at Hohenheim and by M. V. Audouin from larvæ of *Eccoptogaster pygmæus*; *Spathius rugosus* (ii, 44), a unique specimen bred by Nördlinger in spring; *Eurytoma striolata* (ii, 177), a ♀ bred by the same observer at Grand Jouan; *Pteromalus bimaculatus* (cf. *Xylopertha sinuata*, ante), *Roptrocerus eccoptogastri* and, doubtfully, *Helcon carinator*.

240. *Scolytus multistriatus*, Marsh.

Laboulbène records from this species *Meteorus brevipes*, Wesm., *Cœloides scolyticida*, Wesm., *Dendrosoter protuberans*, Nees, and *Cheiropachus quadrum*, Walk. Ratzeburg only gives *Elachestus leucogramma* (Ichn. d. Forst. ii, 174), *Pteromalus bimaculatus* and *P. brunnicans* (ii, 188), all bred by Nördlinger in France. Marshall is somewhat sceptical of its being the host of *Meteorus albicornis*, Ruthe (Bracon. d'Europ. ii, 101), on account of their relative size. Mr. C. T. Gimingham has bred several *Cheiropachus quadrum*

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the larva, pupa, or imago of *Scolytus*. . . . Leaving it to future examination to decide the true genus and relations of these vermicles, I shall here merely observe, in addition to what has been above said, that I have found them upon a large proportion of the pupæ of *Scolytus destructor*, and occasionally on some of the larvæ in an advanced stage of growth, and also on the pupæ of *Hylesinus fraxini*; and in such distant localities, and at such different periods of the year, that I am persuaded that their occurrence was not accidental, but that they are true external parasites, of the family of *Scolytidæ* in the pupa (and partly in the larva) state, in which, however, they do not seem materially to injure them, nor prevent them from becoming perfect insects." (Introd. 7th Ed., 1859, pp. 122-3; cf. also Spence, Trans. Ent. Soc. ii, Proc. xv.) The presence of granular molecules certainly points to a hymenopterous origin of these vermicles, in which case, however, they would have a very decidedly prejudicial effect upon the beetles' final ecdysis.

from this species at Harpenden in Herts. July 22nd, 1904; and he noticed that four or five individuals assisted each imago to emerge. The same parasite has also been commonly found, tapping with its antennæ and running about upon a newly-felled willow pole at Sotherton, in Suffolk, July 6th, 1900.

241. *Scolytus pruni*, Ratz.

Reinhard has, according to Giraud (Ann. Soc. Fr. 1877, p. 427), bred *Raphitelus maculatus*, Walk., from this borer. Kirchner (Cat. 115 et 181) also records from it *Dorycles pomarius*, Reinh., and *Eulophus lophyrorum*, Htg.; though the association appears doubtful in both cases. Of the latter, however, Ratzeburg says (Ichn. d. Forst. ii, 157) that one ♀ emerged with him from *Eccoptogaster pruni* and he received another of the same sex from Bouché, who is also thought to have bred it from *E. pruni*; and he adds, concerning *Elachistus leucogramma* (*l. c.* ii, 174), that, with the described ♂, were numerous ♀♀ from *E. scolytus* and *E. pruni*. Mr. Donisthorpe bred a specimen of *Pteromalus* sp. from this borer in 1906 in London.

242. *Scolytus ratzeburgi*, Jan.

From *Eccoptogaster destructor*, Ratzeburg (*l. c.* ii, 214) says Wissmann bred what he thought was *Pteromalus lunula*, in Germany.

243. *Scolytus rugulosus*, Ratz.

The list of parasites upon this species given by Ratzeburg (Ichn. d. Forst. ii, 214) comprises both *Bracon eccoptogastri*[158] and its variety *B. minutissimus* (ii, 31) bred from it by Reissig in the dying boughs of plum trees; Nördlinger raised *Brachistes longicaudis*[230] (i, 54 et iii, 28) from this borer in ailing apple twigs at Stuttgart; and Bouché *Opius cephalotes*[267] (ii, 63) from the same host and pabulum. *Elachestus leucogramma* (i, 170) is said to also live on this beetle, from which Nördlinger bred one ♀ of *Eurytoma eccoptogastri* (i, 174), with several *Eulophus allipes*,[380] etc., in dying apple boughs which were also tenanted by *Saperda præusta* and several species of *Magdalis*. A few ♂♂ of *Pteromalus bicaliginosus*[327] (i, 190) were also bred from

Eccoptogaster rugulosus, and its ♀ was raised by Bouché (i, 191) from the same host, as has been *P. bimaculatus*[1] and *Storthygocerus subulifer*[308] (ii, 214). Dr. Giraud instances from *C. rugulosus*, *Eucoila minuta*, Gir., *Teleas punctata*, Gir., and *Diapria nigra*, Nees. Reinhard bred his *Dorycles pomarius* from a tree containing these, among other beetles. Bouché bred *Cœnocoelius analis*, Nees, from *S. rugulosus*' boring in an apple tree, and Goureau says that his *Blacus fuscipes* attacks these beetles in their holes in apple trunks and "fait périr un grand nombre de victimes, chaque femelle de *Blacus* en detruisant autant qu'elle a d'œufs à poudre."

244. *Hylastes palliatus*, Gyll.

Herr Saxesen found larvæ of *Pteromalus spinolæ* (Ichn. d. Forst. i, 189 et ii, 193) on the external surface of spruce borers, especially *B. typographus* and *Hylesinus palliatus*, and thought them the commonest and most effective of their foes; though he also found the larvæ of *Pachyceras xylophagorum*[311B] (i, 218) to be a numerous external parasite of the same beetles, in the Hartz. *Pteromalus æmulus* is also indicated (ii, 215) as a doubtful parasite of this species.

245. *Hylesinus*.

Eulophus hylesinorum[408] is recorded by Ratzeburg (*lib. cit.* i, 23) from an unspecified individual of this genus.

246. *Hylesinus crenatus*, Fab.

Nördlinger at Stuttgart discovered that *Mesostenus brachycentrus*[5] (Ichn. d. Forst. iii, 142) was parasitic in the borings of *H. crenatus* and pupated towards the end of May: "it is true," says Ratzeburg, "that there were there

[1] As illustrative of the diversity of this species' hosts, *lib. cit.* ii, pp. 187–8 may be quoted: "This insect emerged from an oak stick in which, besides *Callidium fennicum*, *Apate sinuata* and *Eccoptogaster intricatus* had lived. . . . In July 1846 fresh wood from a two-inch apricot tree was caged in which *Ecc. rugulosus* had numerously bored; already in March 1847 several *Pteromali* had appeared with the sparsely emerging beetles, but fresh ones were bred in the middle of May and even until well into July. . . Lastly a new and very interesting breeding is to be mentioned: Nördlinger at Grand Jouan raised it out of *Bostrichus villosus* in oak, and again out of *Eccoptogaster scolytus* and *multistriatus* in June 1843."

also larvæ of *Clerus formicarius*, but they could not have been the host"—one wonders why not, since their size would appear more appropriate than that of this Cryptid. The same observer also found *Bracon stabilis* (iii, 38) and *Cœloides filiformis* (iii, 72) associating with this borer in ash bark.

247. *Hylesinus fraxini*, Panz.

Feldjäger Angern, in his observations on timber and its injurious insects, bred *Spathius exannulatus*[147] (Ichn. d. Forst. ii, 43) out of this species, as also did Nördlinger at Hohenheim on July 3rd a single ♂ of *Cœloides melanotus* (iii, 40). All its other parasites were, however, Chalcididous: Oberforster Radzay raised fourteen specimens of *Eurytoma flavovaria* (i, 173) from *Hylesinus fraxini* in ash, where they pupated in such a manner as to easily emerge through the beetles' orifice; with it he bred several ♂♂ of *E. ischioxanthos* (i, 174), some spotted-winged *Pteromali* and *Stylocerus ladenbergi*[308] (i, 208). From borings of the same species, Saxesen once bred a single *Eurytoma flavoscapularis* (i, 173); and from its larvæ, Radzay raised *Pteromalus fraxini*, *P. bivestigatus*, *P. binimbatus*[327] and a ♂ *P. bicaliginosus*[327] (i, 190–191). Angern also found one ♂ *Tridymus xylophagorum* (ii, 184) among a mass of *Pteromalus bimaculatus* which had emerged from this borer, as well as *Sciatheras trichotus*[286] (ii, 209) and a single *Eupelmus geeri* (ii, 151); *Eurytoma nodulosa* is also indicated (ii, 215) as preying upon this beetle. Giraud adds *Dendrosoter protuberans*, *Cerocephala corniger a* and also bred in France *Cœlioides filiformis*, *C. melanotus*, *Eurytoma flaveolaria*, *Raphitelus ladenbergi*[308] and *Pteromalus bimaculatus*, Spin., from this host. In May 1906 Mr. Donisthorpe bred a ♀ *Cheiropachus quadrum* at Enfield from a pupa of *H. fraxini*, together with both sexes of *Bracon caudatus*, Ratz., and of *B. longicaudis*, Ratz., of which the latter is new to the British fauna. The same observer also bred, at the same time and from the same beetle, a species of *Pteromalus* at Leighton.

248. *Hylesinus oleiperda*, Fab.

Fonscolombe, quoted by Westwood (Mod. Class. ii, 159), tells us that *Cheiropachus quadrum* also feeds upon the larvæ of this beetle; and Dr. Ratzeburg (Ichn. d. Forst.

ii, 152) that he bred from *Bostrichus suturalis* a single ♀ of *Eupelmus inermis*[280] at Neustadt.

249. *Carphoborus* (*Dendroctonus*) *minimus*, Fab.*

From fir wood bored by this species, Ratzeburg bred several *Entedon hylesinorum* (Ichn. d. Forst. i. 167) of both sexes; *Eurytoma pinetorum* (iii, 220) from *Bostrichus minimus*, together with *Pteromalus azureus* (*l. c.* et iii, 235) from bored fir twigs in May, and *Entedon pinetorum*; from fir wood, with *B. minimus* and *B. bidens*, emerged *Pteromalus azureseens* (iii, 235), and, from *B. minimus* alone, he bred *P. vicarius* (iii, 241), together with *P. azureus*, *Entedon pinetorum*, *Eurytoma pinetorum* and *Spathius brevicaudis*. Nördlinger at Hohenheim raised three different Chalcids from this host: a single ♂ of *Pteromalus ramulorum* (ii, 201) in August; *P. dubius*[316] (ii, 192 et iii, 234) also in August; and *Entedon caudatus* (ii, 170). *Pteromalus siccatorum* (iii, 240) and *Bracon hylesini*[159] are also indicated (iii, 249) as probably preying on this beetle.

250. *Phlœotribus oleæ*, Fab.*

Fitch reminds us (Entom. 1880, p. 258) that Bargagli has bred *Spathius rubidus* from this host.

251. *Hylurgus.*

Cheiropachus quadrum is referred to by Westwood (Mod. Class. ii, 159) as bred from members of this genus by Fonscolombe.

252. *Hylurgus minor*, Htg.

From *Hylesinus minor*, Ratzeburg (Ichn. d. Forst. ii, 191) records both sexes of *Pteromalus azureus*, as numerously bred by Nördlinger at Hohenheim in August.

253. *Hylurgus piniperda*, Linn.

Cooper (Ent. Mag. ii, p. 116) recounts the parasitism of *Cheiropachus pulchellus* upon this species. Ratzeburg (Ichn. d. Forst. ii, 215) gives *Bracon palpebrator* (ii, 89), bred from *Pinus pinaster*, in which *H. piniperda* and *Curculio notatus* lived; *Pteromalus latricllei*[317] (ii, 192), one bred from this borer by Reissig; *P. lunula* (ii, 193), one bred at Neustadt out of this host; *P. pellucens*, *P. multicolor*[368] (ii, 194), raised from it by Nördlinger in

May; and *P. suspensus* (ii, 193), bred by the same observer from *Pinus pinaster*, in which both this species and *C. notatus* had bored—as preying upon it; and adds (*lib. cit.* iii, 249), *Hemiteles modestus*,[18] *H. melanarius* and *Pteromalus guttatus* (iii, 236), which was always bred from fir, in one case containing only *H. piniperda*. Of *Bracon Middendorffii* [177] he says (ii, 33) that it was bred by Reissig on June 18th from fir bark, while the imagines of *H. piniperda* therein were still quite pale and only preparing for flight. . . . Herr Reissig sent him several two-lines long, dirty white, delicate, elongate cocoons from which the Braconid had emerged just below the apex. The dust from the boring adhered to them and also a distinct empty skin of a *Hylesinus piniperda*: the Braconid had certainly sucked it from outside. The same observer later sent it again to him, after the time of the hosts' emergence.

254. *Phlœophthorus rhododactylus*, Marsh.

Phlœophthorus spartii is said by Giraud (Ann. Soc. Fr. 1877, p. 427), upon Aubé's authority, to be the host of *Raphitelus maculatus*, Walk. Nördlinger bred (Ichn. d. Forst. ii, 215) *Storthygocerus subulifer*[308] (ii, 208 et iii, 246) at Bordeaux, Grand Jouan and the Schwarzwalk; and several ♀ ♀ of *Bracon planus*[178] (ii, 33) at Bordeaux, from *Hylesinus spartii*; adding (ii, 31) that a great number of *Bracon hylesini*[159] emerged from it at Hohenheim.

255. *Polygraphus pubescens*, Bach.

From *Hylesinus poligraphus*, Nördlinger bred at Hohenheim at least one *Bracon hylesini*[159] (Ichn. d. Forst. ii, 31), and both he and Radzay also bred *B. Middendorffii*,[177] from this host (ii, 33 et iii, 32). Several specimens of *Cosmophus klugii*[211] (ii, 72) were raised by the latter, as well as of both sexes of *Pteromalus lanceolatus* (ii, 204) from the same borer, which Ratzeburg found was further parasited by *Roptrocerus xylophagorum* (ii, 209), *P. multicolor*[368] (ii, 193), *P. capitatus*, *P. navis*, and, doubtfully, *P. æmulus* (ii, 215).

256. *Cryphalus binodulus*, Ratz.

Out of *Bostrichus binodulus*, its author says (*lib. cit.* ii, 30) that Radzay bred *Bracon silesiacus*[160] (ii, 30) from beneath poplar bark; and probably also *Aphidius obsoletus* (ii, 59),

which emerged in this beetles' breeding cage, though possibly other Coleoptera were also in the enclosed large section of wood.

257. *Cryphalus fagi*, Fab.

Bracon hylesini[159] is recorded (*lib. cit.* iii, 249) from *Bostrichus fagi.*

258. *Cryphalus piceæ*, Ratz.

Only *Roptrocerus xylophagorum* was bred by Nördlinger (Ichn. d. Forst. ii, 209) from *Bostrichus piceæ.*

259. *Cryphalus tiliæ*, Panz.

A single ♂ *Spathius exannulatus*[147] and a species of *Eurytoma* are alone recorded (*lib. cit.* ii, 43) from *Bostrichus tiliæ*, though Ratzeburg bred "countless myriads" from lime trees.

260. *Pityophthorus pubescens*, Marsh.

Dr. Ratzeburg (Ichn. d. Forst. ii, 212) bred *Roptrocerus xylophagorum*, *Pteromalus capitatus*, *P. navis* and perhaps *P. æmulus* (ii, 203) from *Bostrichus pitiographus*; he adds that Nördlinger also raised *P. multicolor*[368] (ii, 193) from the nests of this borer at the end of June—at the time of, or rather later than, their hosts' emergence; as well as *P. navis* (ii, 205) at Hohenheim in spring from the same beetle, with *B. poligraphus* and *B. abictis*, in spruce.

261. *Xylocleptes bispinus*, Duft.

Pteromalus gravenhorstii[318] was bred by Nördlinger (*lib. cit.* iii, 245) from *Bostrichus bispinus* in clematis.

262. *Dryocætes autographus*, Ratz.

From *Bostrichus autographus*, Ratzeburg (*l. c.* ii, 211) records only *Pteromalus multicolor.*[368]

263. *Dryocætes villosus*, Fab.

Marshall (Bracon. d'Europ.) says *Microdus rugulosus*, Nees, and perhaps *Chelonus necsii*, Reinh., have been bred from this borer. Nördlinger (Ichn. d. Forst. ii, 188 et 209) raised *Pteromalus bimaculatus*, *P. multicolor*[368] and *Roptrocerus xylophagorum* from *Bostrichus villosus* in oaks at Grand Jouan, in France.

264. *Taphrorychus bicolor*, Herbst.

Ratzeburg records from *Bostrichus bicolor* (*lib. cit.* ii, 211), *Roptrocerus xylophagorum* (ii, 209), bred by Wissmann, and *Pteromalus multicolor*.[368]

265. *Tomicus*.

From unspecified individuals of *Bostrichus*, the above author (*l. c.* i, 23 et ii, 211) instances *Pteromalus spinolæ*, *P. suspensus*, *P. bimaculatus*, and *Pachyceras xylophagorum*.[311B]

266. *Tomicus laricis*, Fab.

Giraud bred *Diapria elegans*,[438] Jur. et Nees (Ann. Soc. Fr. 1877, p. 435), from *Bostrichus laricis*; from which Ratzeburg further records *Bracon palpebrator* (Ichn. d. Forst. ii, 39), *Roptrocerus xylophagorum*, *Pteromalus suspensus* (i, 189 et ii, 193), bred by Nördlinger from the larvæ at Hohenheim and Neustadt, *P. virescens*[375] and perhaps *P. æmulus*.

267. *Tomicus typographus*, Linn.

"M. L. Dufour detected great numbers of minute *Ascarides*," says Westwood (Mod. Class. i. 354), "in the entrails of *T. typographus*, as well as numbers of small mites on its external surface"; for latter, cf. footnote to *Scolytus destructor*, ante. Possibly these latter may have been the larvæ of *Pteromalus spinolæ* or *Pachyceras xylophagorum*,[311B] both of which Herr Saxesen discovered (Ichn. d. Forst. i, 189 et 218) to be ektoparasitic upon the larvæ of *Bostrichus typographus* and *Hylesinus palliatus* in spruce; the former, he says, are probably the commonest and most effective foes of these two beetles; the latter were also numerous in the Hartz. Ratzeburg raised from this borer *Pteromalus multicolor*[368] and perhaps *Bracon obliteratus*,[175] (*l. c.* ii, 212). And Giraud adds (Ann Soc. Fr. 1877) *Cœloides bostrichorum*, Gir., *Roptrocerus xylophagorum*, *Acrocormus multicolor*, Ratz., and *Pteromalus abicticola*, Ratz., to its parasites.

268. *Tomicus curvidens*, Germ.*

From *Bostrichus curvidens* in blocks of white fir, Radzay bred (Ichn. d. Forst. ii, 141) *Ceraphron pusillus*[432] and Nördlinger found (ii, 209) *Roptrocerus xylophagorum* to be parasitic upon the same species.

269. *Pityogenes bidentatus*, Herbst.

Ratzeburg records from *Bostrichus bidens*, *Bracon Middendorffii* [177] (Ichn. d. Forst. ii, 33), bred by Hartig with one small ♂ of *Spathius brevicaudis* (ii, 43); *Pteromalus bidentis* (ii, 205), a unique and broken specimen by Nördlinger, who had labelled one *Entedon geniculatus* (ii, 160): "Out of *Bost. bidens* from the Black Forest." He adds later (iii, 249) *Bracon Hartigii* [180] (iii, 32), of which Ratzeburg says that he bred this beautiful and rare insect from Weymouth pine, filled with *B. bidens*, together with *Roptrocerus xylophagorum*; *B. labrator*, *B. palpebrator* (iii, 38), by Nördlinger; *Pteromalus guttatus* (iii, 236), bred from fir wood by Herr von Bernuth with *P. suspensus*, *P. virescens* [375] (iii, 243) bred from firs infested by this borer; and *P. azurescens* (iii, 235), also bred by von Bernuth from *B. bidens* in *Pinus strobus*; as well as, doubtfully, *P. siccatorum* (iii, 240), *Eusandalon abbreviatum*, *E. tridens* (iii, 200) and *Bracon hylesini*.[159] Giraud has also bred *Pteromalus guttatus*, *Roptrocerus xylophagorum* and *Dendrosoter Perisii*, Gir., from this species in France.

270. *Pityogenes chalcographus*, Linn.

Pteromalus abieticola was raised by Radzay (*lib. cit.* ii, 191) from *Bostrichus chalcographus* in the spruce woods of the Hartz.

271. *Xyleborus monographus*, Fab.*

The only parasite, instanced by Ratzeburg, of *Bostrichus monographus* is *Ceraphron radiatus*,[433] of which Herr Wissmann (Ichn. d. Forst. ii, 141) bred a single specimen.

272. *Undetermined Coleoptera.*

Several of both sexes of *Cœloides melanotus*, Wesm., "from some wood-boring beetle" (Marshall, Ent. Ann. 1874, p. 144). Nördlinger found *Hemiteles thoracicus*, Ratz., in a breeding cage containing xylophagous Coleoptera (Ichn. d. Forst. iii, 156); *Rogas rugator* [253] is said (*l. c.* ii, 66) to have occurred in the same situation. Brischke (Allgemeine Wirths-Tabelle) has bred *Sigalphus floricola*, *Pteromalus Dahlbomi* and *Entedon xylobius* "from coleoptera." *Alysia manducator*, Panz., "bred from larva found feeding on carrion" (Bignell, Trans. Devon. Assoc. 1901, p. 685—cf. *Crcophilus*, ante). *Rhyssalus indagator*, Hal., "parasite

sans doute de quelques petits Coléoptères xylophages" (Marshall, Bracon. d'Europ. i. 183). *Pimpla brevicornis*, Grav., bred "from pupa of beetle" (Entom. 1885, p. 152). *Apanteles salebrosus*, Marsh., "one and one cocoon, bred from a coleopteron" (Morley, *lib. cit.* 1906, p. 100).

CLASSIFIED LIST OF PARASITES.[1]

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2 Phæogenes suspicax, Wesm., 105
3 „ nanus, Wesm., 238
4 Diadromus subtilicornis, Grav., 105
5 Helcoztisus brachycentrus, Grav., 41, 246
6 Cubocephalus nigriventris, Thoms., 110
7 Microcryptus nigrocinctus, Grav., 9
8 Phygadeuon rufulus, Gmel., 180
9 „ variabilis, Grav., 2
10 Oresbius castaneus, Marsh., 4, 5, 175
11 Hemiteles bicolorinus, Grav., 47
12 „ areator, Panz., 8, 25, 26, 43, 44, 50, 214
13 „ pedestris, Fab., 126
14 „ niger, Tasch., 146
15 „ melanarius, Grav., 41, 188, 233, 253
16 „ argentatus, Grav., 7
17 „ persector, Parf., 7
18 „ æstivalis, Grav., 41, 47, 188, 238, 253
19 Hemiteles completus, Ratz., 57
20 „ thoracicus, Ratz., 272
21 „ subzonatus, Grav., 23, 24
22 Pezomachus instabilis, Först., 214
23 „ corruptor, Först., 214
24 „ comes, Först., 7
25 „ thoracicus, Brisch., 215
26 „ fasciatus, Fab., 16, 201
27 „ palpator, Grav., 49
28 „ sp., 182, 216
29 Mesostenus ater, Ratz., 38, 150
30 Hoplocryptus insectator, Tschek., 185
31 Idiolispa analis, Grav., 105
32 Cryptus minator, Grav., 76
33 „ echthroides, Ratz., 231
34 Cœnocryptus tener, Thoms., 96
35 Coleocentrus caligatus, Grav., 109
36 Arotes albicinctus, Grav., 83
37 Ephialtes imperator, Kricch., 105
38 „ manifestator, Linn., 30, 76, 105
39 „ tuberculatus, Fourc., 73, 95, 105, 187, 217

[1] The numbers prefixed to the parasites' names here given refer to those printed in small type after the now obsolete names in the text, and are intended to facilitate synonymy.

The numbers suffixed to the parasites' names here given refer to the corresponding ones attached to the Coleoptera in the text, and will serve as an index.

40 Ephialtes carbonarius, Christ., 38, 39, 74, 81, 99, 101, 105, 108, 188, 217
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42 „ strobilorum, Ratz., 56
43 „ discolor, Brisch., 40, 96
44 „ glabratus, Ratz., 37, 56
45 „ pusillus, Ratz,, 84
46 „ populneus, Ratz., 73, 105
47 „ continuus, Ratz., 105
48 Pimpla instigator, Fab., 28, 78
49 „ examinator, Fab., 211
50 „ roborator, Fab., 217
51 „ stercorator, Fab. 155, 157
52 „ brevicornis, Grav., 188, 201, 272
53 „ nucum, Ratz., 228
54 „ abdominalis,Grav.,179
55 „ sagax, Ratz., 211
56 „ pomorum, Ratz., 211
57 „ linearis, Ratz., 32, 188, 231
58 „ terebrans, Ratz., 99, 101, 187, 190
59 „ alternans, Grav., 105, 199
60 „ longiventris, Ratz., 155
61 „ laticeps, Ratz., 188
62 „ palliata, Gir., 210
63 „ gymnetri, Ratz., 207
64 „ sp., 184
65 Polysphincta elegans, Ratz.,57
66 „ latistriata, Ratz., 199
67 „ lignicola, Ratz., 40, 73
68 „ soror, Ratz., 57
69 Glypta concolor, Ratz., 234
70 Lycorina triangulifera, Holmgr., 105
71 Lissonota bellator, Grav., 46, 57
72 „ palpalis, Thoms., 110
73 Meniscus catenator, Panz., 29
74 Echthrus nubeculatus, Grav., 105
75 „ populneus, Gir., 105
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79 „ filiformis, Grav., 87, 92, 95, 106
80 „ ater, Grav., 109
81 Xorides albitarsus, Grav., 72
82 „ cryptiformis, Ratz., 46, 57
83 „ crassipes, Htg., 73, 103, 190
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85 „ hercynianus, Htg., 190
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89 Exochus compressiventris, Ratz., 33
90 Orthocentrus fulvipes, Grav. 93, 106
91 „ testaceipes, Brisch., 142
92 Neurateles papyraceus, Ratz., 188
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94 Homoporus tarsatorius, Panz., 16
95 Sphecophaga vesparum, Curt., 152
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97 Mesoleptus teredo, Htg., 73, 109
98 Ophion luteus, Linn., 184
99 Campoplex latus, Ratz., 211
100 Canidia pusilla, Ratz., 39
101 „ quinqueangularis, Ratz,, 135
102 „ subcincta, Grav., 181
103 Nemeritis transfuga, Grav., 106
104 „ gracilis, Grav., 217
105 Diaparsus gilvipes, Grav., 147
106 Thersilochus moderator, Linn., 146, 149, 221, 223

107 Thersilochus morionellus, Holmgr., 20
108 Porizon nutritor, Fab., 230
109 ,, microcephalus, Grav., 123
110 ,, boops, Grav., 149
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112 ,, nigripes, Ratz., 181

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114 ,, pectoralis, Wesm.,
115 ,, scutellaris, Wesm., 56, 153
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117 ,, immutator, Nees, 217
118 ,, fuscipennis, Wesm., 133
119 ,, lævigatus, Ratz., 82, 83
120 ,, hylobii, Ratz., 187
121 ,, flavator, Fab., 73, 99
122 ,, caudatus, Ratz., 247
123 ,, longicaudis, Ratz., 247
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131 ,, urinator, Fab., 183
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146 Spathius erythrocephalus, Wesm., 59
147 ,, exarator, Linn., 43, 47, 54, 57, 199, 238, 247, 259
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